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T. A. RICKARD . . . . . EDITOR
FREDERICK HOBART, SAMUEL SANFORD . . . . . ASSOCIATE EDITORS

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CONTENTS.

Editorials:
Greeting ..... *T. A. Rickard* 1
United States Steel Corporation 2
Mining Possibilities 2
Iron and Coal in 1904 2
Coal Miners' Wages 3
Freiberg 3
Metal and Mineral Production of United States in 1903 3
Production of Gold and Silver in United States *T. A. Rickard* 5
The Gold and Silver Production of the World *T. A. Rickard* 6
The Commercial Movement of Gold and Silver 6
Copper in 1903 8
New York Copper Market 8
London Copper Market 9
Copper Mining in the Southwest ..... *James Douglas* 10
Lake Superior Copper Mining in 1903 10
Lead in 1903 ..... *W. R. Ingalls* 11
New York Lead Market 12
London Lead Market 13
The Cœur d'Alene ..... *Stanly A. Easton* 13
The Southeastern Missouri Lead District in 1903 13
The Sudbury Nickel Mines ..... *A. McCharles* 14
Zinc in 1903 ..... *W. R. Ingalls* 15
New York Spelter Market 16
London Spelter Market 17
The Joplin District in 1903 17
Antimony in 1903 ..... *Joseph Struthers* 18
New York Antimony Market 18
Tin in 1903 18
New York Tin Market 19
London Tin Market 19
Aluminum in 1903 ..... *Joseph Struthers* 20
New Caledonia ..... *F. Danvers Power* 20
*Mining in Mexico ..... *Jas. W. Malcomson* 21
Ontario ..... *Thos. W. Gibson* 23
*British Columbia ..... *S. S. Fowler* 24
*The Transvaal ..... *W. Fischer Wilkinson* 26
*Mining in Western Australia ..... *A. G. Charleton* 28
*Metallurgical Progress in Western Australia *Alfred James* 30
The Eastern States of Australia ..... *F. Danvers Power* 31
Cyanidation in the United States ..... *Charles H. Fulton* 33
*Mining in the Southwest ..... *William P. Blake* 35
Gold and Copper Mines of the South. *Richard Eames, Jr.* 37
California ..... *Charles G. Yale* 37
*Colorado ..... *Forbes Rickard* 38
*Cripple Creek 40
*Wyoming Mines ..... *H. C. Beeler* 40
*Montana ..... *Wm. A. Akers* 41
Nevada ..... *J. E. Spurr* 44
*South Dakota ..... *Samuel S. Arentz* 45
*Iron and Steel in 1903 ..... *Frederick Hobart* 46
Pittsburg Iron and Steel Markets 47
Cleveland Iron Market 49
Lake Freight Market 50
Eastern Pennsylvania Iron and Steel Market 50
Coal in 1903 ..... *Samuel Sanford* 51
Coal Mining in Alabama 52
Coal Mining in Illinois 52
Indiana Coal Mining in 1903 53
Iowa Coal Mining in 1903 ..... *S. W. Beyer* 53
West Virginia Coal in 1903 ..... *James W. Paul* 53
Pittsburg District Coal in 1903 53
The Anthracite Trade 54
The Atlantic Seaboard Bituminous Trade 55
The Oil Industry of California ..... *C. T. Deane* 56
Bromine ..... *Joseph Struthers* 56
Sulphur ..... *Joseph Struthers* 57
The American Chemical and Allied Mineral Trades in 1903 ..... *Chas. C. Schnatterbeck* 57
The Stock Markets in 1903 58
New York Mining Stock Market *Chas. C. Schnatterbeck* 58
Boston Mining Stock Market 61
London Mining Market 62
Dividends and Assessments ..... *Chas. C. Schnatterbeck* 63
Weekly Metal Market:
Gold and Silver Movement 66
Copper, Tin, Lead, Spelter and Antimony 66
Quicksilver, Nickel, Platinum and Cadmium 66
United States Steel Corporation 66

*Illustrated.

EDITORIAL.

GREETING.

A year ago, in assuming the responsibilities of an editorship rendered illustrious by Richard P. Rothwell and Rossiter W. Raymond, I ventured to ask for the assistance of professional men in making this JOURNAL useful to those who are engaged in mining and metallurgical work. It is with no little gratitude that I now thank the large number of men who have cordially come forward with contributions and discussions, the value of which cannot be gainsaid. To my friends, Philip Argall, J. Parke Channing and C. W. Purington, I am especially indebted, but the obligation is further spread out to earnest men in Australia, South Africa, Mexico, and in every part of the great mineral empire of these United States; other friends, not mentioned by name, will accept a cordial grasp of the hand for their assistance, not to this JOURNAL alone, much less to an individual like myself, but to the noble engineering profession to which each one of them belongs, and which each one of them has aided in one way or another by suggestion or description of technical practice and scientific method.

In one of those biographical notices by the Secretary of the American Institute of Mining Engineers, notices which are not so much a memorial to the dead as an inspiration to the living, it is recorded that a certain metallurgist who had collected voluminous data based upon the observation and experience of a life-time, was waiting for the day when he could write something comprehensive and monumental. That day seemed ever about to come, but never came; Death called him across the far divide and all the laborious harvest of a useful life perished with him, all save a few hints which had dropped from time to time like crumbs from a feast of good things. Surely, there is no waste so bad as this; man treads the same paths as his fathers; the least he can do is to hand on his experience, so that those who come after may escape some of the pitfalls that endanger the road. Let us contribute the little that we can *as we go along*, with a generosity that takes no measure of itself and a professional spirit that knows other units than those set by monetary standards.

The fact is, there are many engineers, geologists and metallurgists who hesitate to discuss technical matters or describe developments in practice until they feel in a position to say the final word; to such men, to go off half-cocked is consummate foolishness; and having made up their minds to avoid this

limbo of absurdity, they sit back while others make a few occasional blunders and do a great deal of splendid service in the cause of science or industry. Gentlemen, it is no such narrow spirit as this that has made engineering the impelling force of the modern world, but rather the unselfish interchange which characterized the great leaders of science, all of whom made mistakes that served as the stepping-stones to greater achievement. If we wait for finality of observation, for the last word, the little testimony we could bear will go with us into the Great Silence. When the historian John Richard Green was dying, he expressed a hope that men might say of him, "He died learning." It is the epitaph of all truth-seekers who, like the author of the 'Short History of the English People,' have written and spoken out of the fullness of their enthusiasm for knowledge.

If professional men will inform others with knowledge while they are acquiring it on their own account; if, while learning, they teach; teaching, they will learn. T. A. RICKARD.

January 1, 1904.

THE PRESS OF material on our columns this week has been so great that we are compelled to omit some of the less important yearly reviews which have been sent us, as well as two or three, which unfortunately have reached us too late for insertion in the present number. Our correspondents and readers will understand that to these causes are due the postponement of publication of these articles until our next issue.

THE PASSING OF THE dividend for the last quarter of 1903 on the common stock of the United States Steel Corporation was not unexpected. Its necessity is enforced by the company's statement, which shows that the net surplus available for dividend purposes last year was less than that reported for 1902 by $35,232,144. The balance remaining for 1903, after making all deductions for depreciation and improvement funds, and a special charge of $5,750,000 for depreciation in value of material on hand, is still a large one, amounting to $55,074,380. The falling off in business was wholly in the second half of the year, the first half showing a gain over its predecessor. It could not be expected, however, that the earnings of the company should always remain at the high point reached in a year of unexampled prosperity. Its position is still a strong one, since there was an undivided surplus of $11,962,645 from the operations of 1903, and, though the amount of unfilled orders on hand at the opening of 1904 was 40 per cent less than a year ago, the company was still able to report orders for 3,215,123 tons of material upon its books. With the improvement in business, which is likely to come with the new year, the prospects are not altogether bad; though the common stock, which received 2.5 per cent last year, is not likely to have any return in 1904. It must be remembered, however, that this part of the company's issues was purely speculative in its character, and any dividend return upon it is only to be looked for in exceptional years.

MINING POSSIBILITIES.

The story of 1903 is told in detail on other pages of this issue; its influence will continue to modify the lines of further progress; and now, having paid to the past the regard demanded by all accomplished facts, we turn with the zest of true miners to the potentialities of the future. In mining, the results rendered possible by development have ever been a spur to endeavor; whether it be the next few feet of drifting, the time when the shaft intersects the reef, or the adit encounters the lode, there is in these undefined possibilities all the charm of the unknown, which stimulates the adventurous. Without that spirit of hopefulness mining would die of sheer inanition; with it, new regions are explored, old ones are revived, and the miner pushes his way through the adamantine heart of the underworld.

While 1904 has not the scope which 1804 may have had, because we do know that the cream of mineral concentration represented by the gold-bearing river gravels has been largely skimmed, and, moreover, the outside of the earth has been, for the most part, at least, cursorily examined, nevertheless the increased number of minerals valuable to man and the beneficiation of others previously too refractory for treatment, has enlarged the field of discovery and gives the persistent seeker opportunities by no means less alluring than those which were held out to the Argonauts of 1849 and 1851 in California and Australia.

The Dark Continent has become so civilized as to have a labor problem, the Arctic circle has been invaded by the miner so thoroughly as to be his home, and Pacific islands once celebrated for native savagery are now the playground of a nickel trust; thus has the engineering skill of the modern world broken down ancient barriers. But much unknown territory remains, not so much in the regions represented by vacant spaces on the map, but in the wide tracts of mineral country which have only undergone the preliminary devastation of the first unsystematic mining. Many of the partially explored portions of the Rocky mountains, ancient districts in Europe, some of the gold-fields of Australia, and many of the diggings gophered by the Chinese, will become the basis for further successful development, such as is directed by modern technical skill when aided by the most recent metallurgical processes. But, besides the regions already suggested in a general way, there is a strong probability of a notable revival of mining throughout the Spanish Americas—through Mexico to Patagonia, from the Rio Grande to Tierra del Fuego. Even near Magellan's Straits there are exploring parties at this time, and it will be, we believe, a part of mining history in the future to record a re-opening of old mines and a development of mineral resources southward from Mexico itself, all along the great Cordillera of South America. Pizzaro, Cortez and their fellow-buccaneers only robbed these regions; they garnered the reserves of rich ore and gutted the mines which the Indians had laboriously opened up. It is the destiny, we believe, of the Anglo-Celtic engineer to build up again a mining industry on the ruins of that Spanish devastation and explore with success a mineral belt which is probably the greatest that traverses the crust of the earth.

IRON AND COAL IN 1904.

The year which has just closed, and its predecessor, 1902, have witnessed the highest degree of prosperity in the iron and steel trades which have ever been recorded in this or, perhaps, in any other country. The following pages show that, while the first portion of 1903 kept well up to its predecessor in activity and in high prices, the second portion of the year, and especially the concluding quarter, showed a rapid decline in demand and quotations—so rapid, indeed, as to lead many to believe that we were on the verge of a general panic and break-up. While we do not think that there is any probability whatever of such an outcome, the fact is, nevertheless, to be faced that the great wave of prosperity is over, and we must be satisfied to do business on a more moderate basis.

We do not find that there exist indications at the present time of any panic like that which has been experienced in past years, or, indeed, of any such extreme depression as that which marked 1893 and the preceding years. Trade generally is in a much sounder condition than at that time. The speculative losses, produced by the fall of industrial stocks on the exchanges, have had their effect upon sentiment, of course, but have not radically affected the general course of business and manufacturing. The agricultural interests, which, after all, form the basis of all trade, have been generally prosperous. The mining industries, which share with the agricultural in making that basis, have been in the same condition. The great mass of the people have received good prices for their products, and have paid off their debts, putting them in sound financial condition. There is still a great deal of work to be done, and a great deal of money with which to pay for it. Extravagant projects may be cut down or abandoned, but real improvements are still to be made, and we think many of them will be made during the coming year. The disinclination to buy material, which has been manifested during the last two months, was the result largely of a determination to enforce a reduction of prices to a reasonable limit. To a great extent this has been secured in the iron trade, and only the reluctance of some large interests to abandon high profits has prevented a complete readjustment. This, however, will probably be effected before long.

The condition we have to face, therefore, in 1904, is that of providing for readjustment and lower costs, both of material and wages. It is not altogether a pleasant outlook, but matters are not desperate by any means, and there is every prospect that a basis may be reached upon which a steady and satisfactory business can be done.

COAL MINERS' WAGES.

Since 1898 coal miners in the chief producing districts of the United States and Canada have had substantial increases in wages granted them and have had the opportunity to increase their earnings greatly, as the great demand for fuel has increased the yearly number of working days at the mines. Some of the advances in wages were voluntarily given by operators, who felt that their employees were entitled to a share in the general prosperity; others were obtained by conferences between miners and operators, and some were secured only by great strikes, particularly the advances secured by Pennsylvania anthracite miners in 1900 and 1902. The operators generally have met the higher cost of production due to these wages by selling coal at higher prices, the simplest and easiest thing to do with a great and increasing demand for fuel. It is pretty clear now, however, that coal prices are likely to average lower during 1904 than during 1903, and unless employers and employees are able to discuss trade conditions in a reasonable spirit, the outlook is for strikes of greater or less importance.

A period of advancing prices for products offers the best opportunity for the employees in any industry to demand better pay, and, coincidentally, is most favorable for the growth of labor unions. All intelligent labor agitators know this, and make the most of their opportunities to augment the membership and increase the power of their organizations. The arguments used or the means adopted in this striving for greater power may not always appeal to fair-minded men, but that point need not be considered here. The fact remains that wages to-day in many industries are higher than ever before and the proportion of laborers belonging to unions is probably greater. Certain labor leaders, seeing that conditions point to a lull in the growth of unions, are already, from selfish motives, urging workingmen to resist any threatened cut in wages, and practically advising employers to keep prices at an artificial level by restricting output.

Among trade unions, the United Mine Workers, largely owing to its able leadership, has been very successful in extending its influence, and now, in some States, such as Illinois, practically dictates the rates of wages and conditions of employment. In spite of the published utterances of various people, it is fairly certain that union dictation at the mines has resulted in greater difficulty in introducing labor-saving machinery, irritating interferences with mine discipline and less care in mining and preparing coal. Operators who have put up with these things with an active market for coal may not care to when it is clear that coal prices are bound to decline. There is therefore unusual interest in the coming convention of the United Mine Workers at Indianpolis, which opens on January 18, as the sentiments expressed at this convention will have much to do with the attitude of the representatives of the operators at their joint convention with representatives of the mine workers the following week. This joint convention will seek to establish wage scales for mines in western Pennsylvania, in Ohio, Indiana, Illinois and parts of West Virginia. The scale for mines in central Pennsylvania will be discussed at a joint convention at Altoona in March.

Prophesies as to the demands to be made at these conventions can do no good, but both operators and miners will doubtless be influenced by present conditions in Pennsylvania. The largest employer of labor in the Connellsville region has announced a 17 per cent reduction in wages, and in the Meyerdale region several thousand miners have struck against a 10 per cent cut. In the latter case, the company chiefly interested, to keep its men at work last spring when coal was wanted, voluntarily increased wages 10 per cent. The demand for its coal fell off during the summer, however, and the company has been working only about half its mines for several months. It is pretty clear, therefore, that those miners who have struck have no chance for gaining anything unless there is an improbable increase in the demand for coal. Speaking generally, it may be said that the outlook for coal miners' strikes resulting favorably to the miners is poor. There has been altogether too much encouragement of lawlessness and violence, too much waving of the red flag of socialism and anarchy by labor agitators, and, in addition to this, the public has realized as never before that higher wages for miners means higher prices for coal—that in the end it has to foot the bill. All labor agitators may not recognize this change in public sentiment, but some recognize it clearly, and if their advice is well received by the rank and file there will be no great strikes of miners next spring.

With a Presidential election impending, there will be many appeals to the so-called labor vote, and the shifty demagogue and the yellow newspaper will do their best to confuse issues, and both coal miners and operators must disregard political issues if wages are to be adjusted to prevailing prices without the needless waste, bitterness and suffering that accompany a great strike.

FREIBERG.

Many of our readers will be interested to learn that the Saxon government has brought forward a measure for the complete abandonment of the old silver mines at Freiberg; the proposal provides for a dismantling of the mines and work, and the dismissal of laborers, but the change is to be made gradually and spread over the space of ten years. This action has been decided upon for the reason that the government can no longer see its way to grant the annual subsidy to the mines. There is no doubt that the Landtag will approve the measure, and thereby give the death blow to this old and famous industry. But it is not to be taken for granted that it marks the end of mining in Saxony; on the contrary, the mining industry was never in a more flourishing condition, although activity is now directed chiefly to the coal and lignite deposits. The income from coal mines has increased steadily in recent years.

There is also no reason for believing the closing down of the silver mines means the end of the famous old school of mines. The country is still in need of engineers, and there will be no lack of opportunities at Freiberg for giving practical instruction. In addition to the large coal mines of Saxony, which have the most modern equipment, there are various ore mines, such as the cobalt mines of Schneeberg, the tin mines of Altenberg, and the copper mines of Grasslitz-Klingenthal. It is probable, also, that one of the Freiberg mines will be maintained for purposes of instruction. The future of the Academy therefore is not seriously impaired.

At the St. Louis Exposition a small collection of typical ores from Freiberg will be exhibited which have been selected by Professor Beck. They form a part of the exhibit representing the German chemical industry, and are characteristic of the ores treated by the Freiberg smelting works. They will show that good ore is still found at Freiberg, and that there is plenty of vitality in the old School of Mines which trained so many of our best American engineers and metallurgists. So we send a hearty *Glück Auf* to the old *Bergakademie*.

METAL AND MINERAL PRODUCTION OF THE UNITED STATES IN 1903.

Believing that statistics of annual production lose value in proportion as their publication is delayed, and that preliminary estimates are often of far greater value to the man of affairs than the most exact returns obtainable, published a year later, THE ENGINEERING AND MINING JOURNAL herewith offers its readers its tabulated estimates of the metal and mineral production of the United States in 1903, the gold production of the world, and valuable notes on the output of these basal commodities—coal and iron—by the principal producing nations. These figures are obtained from many sources; the greatest care has been taken in their compilation, and it is believed that the revised figures, to be published next June, will show but slight changes from those here given for gold, silver, lead, zinc and iron, and for such minerals and products as iron ore, coal, phosphate rock, sulphur, copper sulphate, iron pyrite, graphite, and portland cement. For the other substances enumerated in the following columns, the returns received are sufficient to warrant presenting the figures given as close approximations. In the compilation of the totals presented, returns furnished by individual producers and associations of producers, by railroads, by State bureaus and officials, and by bureaus of foreign governments were used—to all of whom the JOURNAL herewith, on behalf of its readers, offers its thanks. In particular the JOURNAL has made use of figures of output in past years compiled by the United States Geological Survey, and of the estimate of gold production in the United States for 1903, as furnished by the director of the United States Mint.

Besides the statistics mentioned, this number of the JOURNAL contains reviews of metal, mineral and chemical markets that summarize the course of prices during the past year. In addition, and, perhaps, of more interest to mining men generally, will be found reviews of the progress made in various branches of metallurgy, and of the work done in the chief mining districts of the United States and of the world. Thus this annual statistical number is intended to furnish the miner, the engineer, the chemist, the broker, the investor, the financier, and, in fact, everyone interested in the mineral industry in any way, with facts obtainable from no other publication.

METALLIC PRODUCTS.

Aluminum.—The production of aluminum in 1903 was about 7,500,000 lb., valued at $2,325,000, as compared with 7,300,000 lb., valued at $2,284,590, in 1901 As heretofore, the output was made by a single concern, the Pittsburg Reduction Company. The exports of aluminum and aluminum manufactures during the first eleven months of 1903 were valued at $143,732, as compared with a value of $110,937 in the corresponding period of 1902.

Antimony.—There was no production of antimony from domestic ores in 1903, but from foreign ores and from hard lead smelted in the United States there was made a total of 6,967,778 lb., valued at $535,486, as compared with 7,122,209 lb., valued at $634,506, in 1902. The importation of regulus or metal into the United States during the eleven months ending November 30, 1903, amounted to 5,007,915 lb., valued at $274,363, against imports of 5,316,337 lb., valued at $321,328, during the same period of 1902.

Copper.—The production of copper in 1903 was 670,880,000 lb., valued at $88,334,770, as compared with 610,815,384 lb., valued at $71,072,586, in 1902. The quantity of metallic copper, other than manufactures, imported during the first eleven months of 1903 were 126,615,475 lb., valued at $15,996,502, against 86,857,978 lb., valued at $11,126,239, in the corresponding period of 1902. The exports were 272,000,604 lb., valued at $36,200,667, in the eleven months of 1903, and 336,023,154 lb., valued at $41,179,887, in 1902. The quantity of copper metal reexported was 2,093,103 lb., valued at $261,413, in 1903, and 11,180,897 lb., valued at $1,548,441, in 1902.

Gold.—The production of gold in the United States in 1903 was 3,600,645 troy oz., valued at $74,425,340, as compared with 3,870,000 oz. and $79,992,800 in the previous year. Besides the output of gold from domestic ores, a large quantity of gold is recovered by the refineries each year from foreign ores and bullion, the output from these sources in 1902 being valued at $34,932,211. The imports of gold during the eleven months ending November 30, 1903, were $48,037,398, against $42,006,681 in the same period of 1902; the exports for the eleven months were $42,882,178 in 1903, and $33,177,479 in 1902.

Iron.—The production of pig iron showed a small increase in 1903, thus establishing a new record for the industry in the United States. The total output was 17,942,840 long tons, against 17,821,307 tons in 1902, a gain of about 0.7 per cent. There was a large decline in the average market prices of the different grades of pig iron, and the total value of the product was approximately $265,554,032, against $303,156,995 in 1902. The imports of pig iron into the United States in 1903 were 602,855 long tons, and were 1,963,898 lb., valued at $566,698. The imports of ore and matte for the same period were 6,116 long tons, valued at $557,087; these totals, however, do not include Canadian matte, the bulk of which is refined in the United States.

Quicksilver.—The production of quicksilver in 1903 was 29,103 flasks, valued at $1,295,083, against 34,451 flasks, valued at $1,500,142, in the previous year. The exports during the first eleven months of last year were 1,280,298 lb., valued at $682,700, as compared with 942,980 lb., valued at $535,702 in the same period of 1902.

Silver.—The total output of silver from domestic ores in 1903 was 56,519,793 troy oz., valued at $30,520,688, against 55,500,000 oz., valued at $29,415,000, in 1902, showing an increase of 1,019,793 oz., or about 1.8 per cent. No statistics of the quantity of silver recovered from foreign ores and bullion in 1903 are available at this time, but the total for 1902 was 48,087,244 oz. The imports of silver during the eleven months of last year, ending November 30, were valued at $21,895,853, as compared with $23,

Carborundum.—The sole producer of carborundum in the United States reported an output of 4,724,000 lb., valued at $472,400, against 3,741,500 lb., valued at $374,150, in 1902.

Cement, Natural Hydraulic.—The output of natural hydraulic cement in 1903 was about 8,200,000 bbl., valued at $3,480,000, as compared with 9,083,759 bbl., valued at $4,087,692, in 1902.

Cement, Portland.—The production of portland cement continued to increase during 1903, and approximated 19,000,000 bbl., valued at $20,900,000, which compares with 16,535,000 bbl., and a value of $16,637,500, in the previous year.

Coal and Coke.—The output of coal in the United States in 1903 reached the enormous total of 356,796,691 short tons, valued at $484,505,524, against 300,276,451 tons, valued at $368,911,538, in 1902, a gain of about 19 per cent. Of the total in 1903, which is the largest ever recorded, 283,406,691 tons, valued at $334,056,024, were bituminous coal, and 73,390,000 tons, valued at $150,449,500, anthracite coal. The

MINERAL AND METAL PRODUCTION OF THE UNITED STATES.

Non-Metallic.	Customary Measure.	1902. Quantity. Customary Measures.	1902. Quantity. Metric tons.	1902. Value at place of production. Totals.	1902. Value at place of production. Per met. ton.	1903. Quantity. Customary measures.	1903. Quantity. Metric tons.	1903. Value at place of production. Totals.	1903. Value at place of production. Per met. ton.
Arsenic, white	Sh. T.	1,353	1,227	$81,180	$66.16	590	535	$35,400	$66.16
Bauxite	L. T.	27,322	27,759	121,465	4.38	40,700	41,351	179,080	4.33
Bromine	Lb.	513,913	233	128,472	551.39	603,500	274	172,000	627.74
Carborundum	Lb.	3,741,500	1,697	374,150	220.48	4,724,000	2,143	472,400	220.44
Cement, nat. hydraulic	Bbl. (300 lb.)	9,083,759	1,236,110	4,087,692	3.31	8,200,000	1,115,849	3,480,000	3.12
Cement, portland	Bbl. (380 lb.)	16,535,000	2,831,942	16,637,500	5.88	19,000,000	3,274,971	20,900,000	6.38
Coal, anthracite	Sh. T.	41,451,267	37,604,343	83,002,229	2.20	73,390,000	66,578,971	150,449,500	2.26
Coal, bituminous, including cannel	Sh. T.	258,825,184	234,807,388	285,909,309	1.22	283,406,691	257,104,863	334,056,024	1.30
Coke	Sh. T.	24,550,000	22,271,614	55,237,500	2.48	25,200,000	22,861,217	56,700,000	2.48
Cobalt oxide, from foreign ores	Lb.	17,140	Kg. 7,775	38,736	Kg. 4.98	18,800	Kg. 8,528	42,300	Kg. 4.96
Copper sulphate	Lb.	48,763,538	22,119	2,028,563	91.71	38,773,944	17,588	1,628,516	92.60
Copperas	Sh. T.	19,784	17,948	118,474	6.60	20,700	18,779	134,550	7.17
Crushed steel	Sh. T.	368	333	51,450	154.50	378	343	52,850	154.08
Fluorspar	Sh. T.	27,127	24,609	143,520	5.83	29,300	26,581	149,500	5.62
Graphite, crystalline	Lb.	4,176,824	1,895	153,147	80.80	4,177,020	1,895	154,549	81.56
Graphite, artificial	Lb.	2,358,828	Kg. 1,060,996	110,700	Kg. 0.10	1,938,000	Kg. 879,071	160,479	Kg. 0.18
Iron ore	L. T.	34,636,121	35,190,299	64,769,546	1.84	31,605,550	32,111,239	52,149,157	1.63
Lead, white	Sh. T.	114,658	104,011	11,978,172	115.16	112,700	102,241	12,228,024	119.60
Lead, red	Sh. T.	11,669	10,586	1,262,712	119.28	12,300	11,158	1,385,900	124.21
Lead, orange mineral	Sh. T.	867	787	138,349	175.79	1,000	907	168,000	185.23
Limestone flux	L. T.	9,490,090	9,644,931	5,504,252	0.59	9,509,790	9,661,947	5,507,310	0.57
Litharge	Sh. T.	12,755	11,571	1,299,443	112.30	12,400	11,240	1,326,800	118.04
Phosphate rock	L. T.	1,464,668	1,488,103	4,636,516	3.12	1,477,601	1,501,243	5,328,018	3.55
Pyrite	L. T.	228,198	231,849	971,796	4.19	196,970	200,122	778,031	3.88
Sulphur	L. T.	7,443	7,562	220,560	29.03	12,054	12,247	262,175	21.42
Zinc, white	Sh. T.	52,730	46,929	4,023,299	85.73	59,810	54,259	5,005,394	92.25
Zinc ore, exported	Sh. T.	54,613	49,582	1,449,104	29.23	37,619	34,125	932,724	27.33
Zinc, lead	Sh. T.	4,000	3,629	225,000	62.00	4,500	4,082	253,125	62.00
Total non-metallic				$544,702,836				$654,091,806	
Metallic:									
Aluminum	Lb.	7,300,000	Kg. 3,312,258	2,284,590	Kg. 0.69	7,500,000	Kg. 3,401,976	2,325,000	Kg. 0.68
Antimony	Lb.	7,122,209	3,230	634,506	196.44	6,967,778	3,161	535,486	169.40
Copper	Lb.	610,815,384	277,064	71,072,586	256.55	670,880,000	304,309	88,334,770	290.66
Gold	Troy oz.	3,870,000	Kg. 120,369	79,992,800	Kg. 664.60	3,600,645	Kg. 111,992	74,425,340	Kg. 664.60
Iron, pig	L. T.	17,821,307	18,106,448	303,156,995	16.74	17,942,840	18,229,925	265,554,032	14.57
Lead	Sh. T.	280,524	254,489	22,829,043	89.70	289,030	262,206	24,492,402	93.41
Nickel, from foreign ores	Lb.	10,391,478	Kg. 4,713,544	4,720,293	Kg. 0.96	11,200,000	Kg. 5,080,287	4,872,000	Kg. 0.96
Platinum	Troy oz.	94	.....	1,814	Kg. 620.17	....	....	....	....
Quicksilver	Flasks	34,451	1,195	1,500,142	1,255.35	29,103	1,010	1,295,083	1,282.26
Silver	Troy oz.	55,500,000	Kg. 1,726,229	29,415,000	Kg. 16.77	56,519,793	Kg. 1,757,943	30,520,688	Kg. 17.36
Zinc	Sh. T.	158,237	143,552	15,317,342	106.70	156,318	141,811	16,882,344	119.05
Total metallic				$530,725,111				$509,037,145	

the exports for the same year were 17,111 tons, against 625,383 tons and 27,487 tons, respectively, in 1902.

Lead.—The total output of desilverized, soft and antimonial lead produced in 1903 was 289,030 short tons, valued at $24,492,402, as compared with 280,524 tons, valued at $22,829,043 in the previous year, showing an increase of about 3 per cent. In addition, there was a production in 1903 of 84,771 tons of lead from foreign ores and bullion. The imports of lead in ores and all forms other than manufactures during the first eleven months of 1903 amounted to 196,936,017 lb., valued at $3,510,043, against 193,828,431 lb., valued at $4,141,032, in 1902. The exports were 111,269 lb., valued at $6,156 in 1903, and 6,477,380 lb., valued at $283,248, in 1902.

Nickel.—As in the preceding year, no nickel was made from domestic ores during 1903. There was a small increase in the production of nickel from Canadian and New Caledonian ores, the total being estimated at 11,200,000 lb., valued at $4,872,000, as compared with 10,391,478 lb., valued at $4,520,293, in 1902. The exports of nickel in the form of metal, oxide and matte for the first eleven months of 1903 701,649 in the same period of 1902. The exports were $34,119,689 in the eleven months of 1903, and $43,726,079 in the eleven months of the previous year.

Zinc.—The production of zinc in 1903 showed a slight falling off, the total being 156,318 short tons, against 158,237 tons in 1902, a decline of 1.2 per cent. This small decrease was more than counterbalanced by the rise in prices, so that the total value of the product in 1903 was $16,882,344, as compared with $15,317,342 in 1902. During the first eleven months of 1903 the imports of zinc and manufactures of zinc were valued at $48,761, as compared with $71,745 in 1902; while the exports for 1903 were $205,290, against $402,345 for 1902.

NON-METALLIC PRODUCTS.

Arsenic.—The production of arsenic in 1903 was 590 short tons, valued at $35,400, against 1,353 tons, valued at $81,180 in 1902.

Bauxite.—There was a large increase in the output of bauxite, which amounted to 40,700 short tons, valued at $179,080, as compared with 27,322 tons, valued at $121,465, in the preceding year.

output of coke was 25,200,000 short tons, valued at $56,700,000, against 24,550,000 tons and $55,237,500 in 1902. The imports of anthracite coal during the first eleven months of 1903 were 151,005 long tons, valued at $675,527, against 53,428 tons, valued at $251,447, in the corresponding period of 1902; and the imports of bituminous coal amounted to 3,095,736 long tons, valued at $8,811,528, against 2,157,691 tons, valued at $6,072,524, in the eleven months of 1902. The exports of anthracite and bituminous coal, respectively, for the eleven months of 1903 were 1,899,592 long tons, valued at $9,243,378, and 5,903,688 tons, valued at $16,268,410, against 767,850 tons of anthracite, valued at $3,600,217, and 5,903,688 tons of bituminous, valued at $16,268,410, in 1902. The exports of coke during the first eleven months of 1903 were 380,619 long tons, valued at $1,924,667, against 355,237 tons, valued at $1,625,258, in the corresponding period of 1902.

Cobalt Oxide.—There was a production of about 18,800 lb. cobalt oxide, valued at $42,300, in 1903, against 17,140 lb., valued at $38,736 in 1902.

Copper Sulphate.—The output of copper sulphate, including both the product made from metallic cop-

per and that recovered in the process of copper refining, was 38,773,944 lb., valued at $1,628,516, against 48,763,538 lb., valued at $2 in 1902. The destruction by fire of the works of one of the largest producers was accountable for the marked decrease in production in 1903. The exports during the eleven months ending November, 1903, were 18,150,224 lb., valued at $746,023, as compared with 30,133,845 lb., valued at $1,202,530, in the corresponding period of 1902.

Copperas.—The production of copperas in 1903 amounted to 20,700 short tons, valued at $134,550, against 19,784 tons, valued at $118,474, in 1902. These totals include only the product marketed as copperas, the quantity used in the manufacture of Venetian red and Indian red not being reported.

Crushed Steel.—A small increase was recorded in the output of crushed steel, the total being 378 short tons, valued at $52,850, against 368 tons, valued at $51,450, in the previous year.

Fluorspar.—There were 29,300 short tons of fluorspar produced in 1903, against 27,127 short tons in 1902. The value of the product in 1903 was $149,500, as compared with $143,520 in 1902.

Graphite.—The production of crystalline graphite in 1903 was 4,177,020 lb., valued at $154,549, against 4,176,824 lb., valued at $153,147, in 1902. The sole producer of artificial graphite reported an output of 1,938,000 lb., valued at $160,479, as compared with 2,358,828 lb. and $110,700 in 1902.

Iron Ore.—The output of iron ore fell off in 1903, the total being 31,605,550 long tons, valued at $52,149,157, against 34,636,121 tons, valued at $64,769,546, in 1902. The imports of iron ore in the first eleven months of 1903 amounted to 955,236 long tons, valued at $2,191,414, against 1,063,025 tons, valued at $2,363,509 in the same period of 1902.

Lead Pigments.—The production of lead pigments was as follows: White lead, 112,700 short tons, valued at $12,228,024, in 1903, and 114,658 tons, valued at $11,978,172, in 1902; red lead, 12,300 short tons, $1,385,900, in 1903, and 11,669 tons, $1,262,712, in 1902; litharge, 12,400 tons, $1,326,800, in 1903, and 12,755 tons, $1,299,443, in 1902; orange mineral, 1,000 short tons, $168,000, in 1903, and 867 tons, $138,349, in the preceding year.

Limestone Flux.—The quantity of limestone consumed in the iron furnaces is estimated at 9,509,790 long tons, valued at $5,507,310, as compared with 9,490,090 tons, valued at $5,504,252, in 1902.

Phosphate Rock.—The output of phosphate rock was 1,477,601 long tons, valued at $5,328,018, in 1903, against 1,464,668 tons, valued at $4,636,516, in 1902. The exports of crude phosphates during the eleven months ending November, 1903, were 720,161 long tons, valued at $5,603,957, as compared with 758,687 tons, valued at $5,856,077, in the corresponding period of 1902.

Pyrite.—The production of pyrites in 1903 was 196,970 long tons, valued at $778,031, against 228,198 tons, valued at $971,796, in 1902. There were imports of 380,578 long tons, valued at $1,505,234, during the first eleven months of 1903, and 384,560 tons, valued at $1,453,730, in the same period of 1902.

Sulphur.—There was an important increase in the output of sulphur, the total being 12,054 long tons, valued at $262,175, as compared with 7,443 long tons, valued at $220,560, in 1902. The imports of sulphur for the first eleven months of 1903 were 171,265 long tons, valued at $3,328,467, against 153,870 tons, valued at $2,975,630, in the corresponding period of 1902.

Zinc White.—The production of zinc white in 1903 was 59,810 short tons, valued at $5,005,394, as compared with 52,730 tons, valued at $4,023,299, in 1902.

Zinc Ore.—The exports of zinc ore in 1903 (December estimated) were 37,619 short tons, valued at $932,724, against 54,613 tons, valued at $1,499,104, in the previous year.

Zinc-Lead Pigment.—The single producer of zinc-lead pigment reported an output of 4,500 short tons, valued at $253,125, as compared with 4,000 tons, valued at $225,000, in 1902.

PRODUCTION OF GOLD AND SILVER IN THE UNITED STATES.

By T. A. RICKARD.

By the courtesy of the Director of the Mint we are enabled to give the production of precious metals in the United States during 1903, and also the distribution. It will be seen from the tabulated statement that there is a decrease in gold amounting to about $5,500,000, while the silver production shows an increase of $1,000,000, due partly to the better price for the metal (which has averaged one cent higher), the total in ounces being 55,500,000 for last year as compared to 56,519,000 oz. in 1903.

APPROXIMATE DISTRIBUTION BY PRODUCING STATES AND TERRITORIES OF THE PRODUCT OF GOLD AND SILVER OF THE UNITED STATES FOR THE CALENDAR YEARS 1902 AND 1903.

(As estimated by the Director of the United States Mint.)

State or Territory.	1902. Gold.	1902. Silver.*	1903. Gold.	1903. Silver.*
Alabama	$2,500	$53	$5,085	$28
Alaska	8,345,800	48,700	6,921,157	16,540
Arizona	4,112,300	1,612,843	4,784,000	1,932,115
California	16,792,100	477,424	16,535,525	497,664
Colorado	28,468,700	8,308,280	22,000,000	7,517,812
Georgia	97,800	212	61,752	202
Idaho	1,475,000	3,103,044	2,067,183	3,915,000
Maryland	2,500	.....	620	.....
Michigan	.....	58,724	.....	59,832
Montana	4,373,600	7,019,214	4,134,367	5,400,000
Nevada	2,895,300	1,985,486	3,576,227	2,376,000
New Mexico	531,100	242,316	372,003	151,200
North Carolina	90,700	11,077	97,571	4,784
Oregon	1,816,700	49,449	1,364,341	67,500
South Carolina	121,900	159	102,573	143
South Dakota	6,965,400	180,306	6,889,302	75,471
Tennessee	.....	6,519	41	.....
Texas	.....	236,486	.....	240,948
Utah	3,594,500	5,740,801	5,064,599	8,100,000
Virginia	3,100	3,127	4,506	301
Washington	272,200	328,070	434,109	164,700
Wyoming	38,800	2,650	8,280	440
Total	$80,000,000	$29,415,000	$74,425,340	$30,520,688

*Commercial value.

In glancing over the distribution of gold production it will be seen that the decrease in Colorado corresponds closely to the total decrease in the United States as a whole, that is to say, the falling off is about $6,500,000. This result is due almost wholly to the labor troubles which have hindered mining in the two leading districts of Cripple Creek and Telluride. California shows no appreciable change, and would have exhibited an increase if the drought had not shut off water from many of the stamp-mills and placers during the latter part of the year. South Dakota, the next in importance, is also without change, in spite of a good deal of activity in improved cyanide methods, the benefit of which may become better apparent in 1904. Similarly, Montana just about holds her own; the smaller total quantity obtained from Butte ores, in the course of refining the copper product of that region, is balanced by the greater activity which has marked gold mining in the outside districts, especially those of Fergus county.

Idaho has increased her output slightly, and so has Nevada, although in the latter case the growth of gold production is less than might have been expected, having regard to the developments at Tonopah. However, in that district the mine capable of the largest production has been held down to exploratory work and several neighboring young mines are still in course of equipment and development, so that 1904 will be more likely to reflect the successful operations of the past year than the record of 1903 itself.

The southern gold-producing States show a falling off, but their total output has never been commensurate with the efforts made to stimulate the interest in them.

Two other important gold mining regions require special mention; Alaska has not done as well as in 1902, although many who were aware of the general activity throughout the far North expected a better showing. The output from the sands at Nome has been decreasing, and this decrease has more than balanced the better yield from the new regions now in process of being opened up. Nome produced $5,050,000 in 1902, while in 1903 the total was only $4,476,775. The present year brings the promise of a further expansion of lode mining throughout southeastern Alaska, more especially in the Juneau district.

In both gold and silver Utah scores a notable advance, the aggregate increase in both metals amounting to nearly $4,000,000. This is a most satisfactory showing, more especially as it is directly traceable to the application of technical skill of the highest order. The bigger gold output is traceable largely to the expansion of mining operations in the Bingham district, where a rapidly growing copper production includes a proportionate increase in the precious metals extracted out of the ores in association with copper. The Tintic district has also contributed to the advance, which would have been more marked if Mercur had not dwindled in importance.

In the silver production of Utah, the great mines at Park City continue to exhibit remarkable vitality, and are responsible for an increased output. Bingham and Tintic have also contributed through the silver separated by refining from their large output of copper bars and matte.

Colorado has held the lead as the greatest silver producing State ever since 1880, when Leadville enabled it to win supremacy from Nevada, where the Comstock mines were then beginning to decline in importance. Until 1903 Colorado exceeded any other State as a producer of silver, therefore the drop to second place is a matter of great interest; it is associated, as was the dominant position of the past twenty-five years, with the fortunes of Leadville, whose output culminated in 1887, and has been declining since then. At the present time a large tonnage of ore, about 50,000 tons per month, continues to be mined, but much of this is chiefly valuable as a flux for smelting silicious ores from other districts. Leadville is not worked out, but unless new discoveries elsewhere are found, to balance the decline of Creede, Clear Creek and the distinctively silver mines of the San Juan, such as those of Red Mountain and Ouray, it is not likely that Colorado will regain her premier position.

Montana shows a falling off, due largely to interruption in mining at Butte by reason of vexatious litigation, harrassing to the copper mines, the output of which includes an important contribution of silver. There has been greater activity among the lessees in the Walkerville mines, but the old Phillipsburg district, once a prolific producer, is now unimportant, and no new silver resources have been opened up elsewhere in the State. Idaho has done better than last year, by reason of the increased activity in the Coeur d'Alene region, now no longer crippled by labor troubles. Nevada put out about $500,000 more in silver, this being due to Tonopah. As the new camp gets into stride there ought to be a further growth in Nevada's output, for it is a fact that the State once made so famous by the Comstock and Eureka has taken on renewed vigor during the last two years. Arizona a little more than holds her own, but when the Tombstone mines are unwatered and fully reopened there will be a notable increase. The water level is now 100 ft. below the 600-ft. station of the old Contention mine, and there is a probability of some return to the productiveness which made Tombstone famous about twenty years ago.

On the whole the statistics for 1903 indicate that there is no falling off in the production of the precious metals in the United States, for the silver output remains practically unchanged and that of gold shows a decrease due entirely to labor troubles in Colorado, creating an obstacle to mining which is only temporary. The outlook for 1904 includes many promising features.

Of these, the cessation of labor disturbances in Colorado may be looked for; Utah is undoubtedly undergoing notable development, especially in the production of gold and silver-bearing copper bullion; in Nevada the exploitation of the new districts is likely to exhibit statistical results, while in California and South Dakota, normal progress will serve to maintain the present output, even if it is not increased.

THE GOLD AND SILVER PRODUCTION OF THE WORLD.

By T. A. RICKARD.

While the statistics of production from the various countries are not all to hand at this time, sufficient information concerning the yield of the principal regions is already available. The output of gold in 1903 is the highest on record, aggregating a total of $327,000,000, which is about $16,000,000 above the previous maximum, in 1899. Toward the close of the year the South African war began to affect mining operations in the Transvaal; in 1902 the cessation of hostilities permitted of a resumption of activity, resulting in a production of $35,250,155. A further expansion of energy and the re-starting of more mines has been marked by a steady monthly increase in the output, so that from a total of 182,749 oz. of fine gold in November, 1902, the production grew to 272,107 oz. in the corresponding month of the year which has just ended. This does not include Rhodesia, but all the Transvaal mines. It is estimated that the output for 1903 is 2,953,910 oz. fine, valued at $61,527,231, which may be compared with the highwater mark of 1898, when the production reached 4,295,609 oz. of bullion, equal to 3,614,385 oz. of fine gold, having a value of $74,709,338. It is apparent, therefore, that the present rate of production, namely, about 275,000 oz. per month, will enable 1904 to come close to the previous high record. By reference to the special article on the progress of mining in the Transvaal, appearing on another page of this issue, it will be seen that all further advance depends upon a solution of the labor problem. There is plenty of ore blocked out and ready for milling, there are numerous idle mines ready to resume a steady output, but unless more laborers become available, these possibilities cannot be utilized in a commercial way. At the present moment it seems probable that arrangements to import Chinese coolies under indenture will be made, under proper authority, but if the Orient should become the scene of warfare, as appears likely, then this plan will have to be abandoned for a period, during which the lack of labor will seriously hinder further progress in the Transvaal.

In Rhodesia, to the north, the lack of native labor has also hindered mining operations since the Boer war, but to a less degree. The output for 1903 was 214,122 oz. of bullion during the first 11 months, or about 231,000 oz., valued at $4,146,250, for the whole year. This is the highest figure ever reached, and compares with $3,573,822 in 1902. While exaggerated notions of the possibilities of the Rhodesian gold-fields no longer pass current, the realization of facts has resulted in a systematic development of the mines and the introduction of economies hitherto unattempted.

The leading gold-producing region to-day is Australasia, the output for 1903 having reached a total of $88,000,000, which is the highest on record since the great days of placer mining 40 years ago, when the alluvial deposits of Victoria astonished the world. In 1856 Victoria alone produced 3,053,744 oz., valued at over $60,000,000.

Western Australia contributed 2,441,241 oz. fine, or $42,184,622; that is to say, this State is credited with very nearly one-half of the total yield of Australasia. Of the increase for the whole Commonwealth and New Zealand, namely, about $5,500,000 more than the total for 1902, fully $3,500,000 is attributable to the better showing made by Western Australia, alone. The remainder of the increase is shared by Queensland, Victoria and New South Wales, in the order named.

The history of gold mining in Western Australia during 1903 is eminently satisfactory, because it includes, not only successful underground exploration, but a betterment in technical practice, with a resulting lowering of costs such as marks the best kind of mining. The magnificent proportions of the industry are due largely to a group of sixteen mines, which together contribute two-thirds of the total production of the State. They are chiefly identified with the Kalgoorlie district. There is reason to believe that these mines are likely to maintain their production for several years, because they have large reserves of ore. The deepest workings, at 1,700 ft., make a good showing, and the gradual improvements in ore reduction, due to unremitting metallurgical investigation, promises a diminution in costs such as will render available a constantly increasing tonnage. This region has been, and is still, remarkable for the unusually high average tenor of the ore, namely, slightly over 1 ounce of gold per ton. Such a yield is more than twice the average content of the lode matter treated in other regions and has been the chief stimulus to conquering the obstacles presented by an arid tableland in the inaccessible interior of the Australian continent; so that to-day a gigantic water system and numerous railways serve the needs of a mining region which 12 years ago was an unexplored desert.

In Queensland, the Gympie district has undergone expansion, the year 1903 being further marked by the working of profitable gold ore at a vertical depth of 3,069 ft., in the West of Scotland mine. A similar interesting feature is presented by the old district of Bendigo, in Victoria, where the New Chum Railway mine struck free gold at a vertical depth of 3,876 ft., the deepest gold mining ever achieved by man. A neighboring mine, the Victoria Quartz, also found profitable ore at 3,814 ft. These explorations into the deep will encourage the miner all over the world, and will serve to balance the recognition of the fact that the superficial deposits are becoming rapidly exhausted. This is true, in large measure, of the great placer deposits of Arctic America to-day, as it was true of California and Victoria fully 30 years ago. The bonanzas of the Klondike and Cape Nome have been fairly skimmed of their cream, but much good gravel still remains. Because the Yukon produced $13,665,000 during 1903, the total output of Canada reached $19,500,000, which is about $1,250,000 less than 1902. British Columbia is credited with $5,125,000, an increase of about $350,000 over the return for the previous year.

Mexico has helped the world-wide increase by producing $12,550,000, as compared to $11,293,524 in 1902. The gold production of our neighbor Republic exhibits a steady annual growth, and the information to hand regarding mining developments in the various States indicates that this advance will be maintained at an augmenting ratio during the current year.

In India there has been a larger production, from $9,683,798 to $11,118,820; this increase is largely due to the magnificent showing of the Champion Reef mine, which paid dividends at the rate of 165 per cent for the year. This mine is situated in the Kolar gold-field, in Madras, the only part of India which has gained importance in gold mining. For 11 months the output was 550,120 oz. of bullion, as against 446,213 oz. for the corresponding period of 1902. This district contains a small group of well-managed mines, controlled in London; most of them have been systematically opened up and are in a position to maintain a big output for several years.

Statistics of the Russian output are not to hand, but the yield of that wide territory is not subject to violent fluctuation. The center of production is moving steadily eastward, as the old placers of the Ural become exhausted, while the country bordering the Amur river and the region northeast of Lake Baikal become developed.

The production of the United States has received separate consideration on another page.

The world's production of silver in 1903 was approximately 165,700,000 try oz., as compared to 163,936,704 oz. in 1902. Mexico and the United States gave the largest increase, amounting to about 3,000,000 oz. in the aggregate, while there was a decline in the output of Canada and Australia. Mexico still holds the leading position with an output of about 60,000,000 oz., as compared to 57,985,332 oz. in 1902. The Republic is undergoing energetic development and there is every reason to expect that the growth in production of both the precious metals will proceed hand in hand; the re-opening of old mines, which follows the extension of the railway into districts crippled by heavy freight and smelter costs, is sure to stimulate the production of 1904. In the United States, as stated elsewhere, the output of silver remains nearly steady and is now mainly a by-product in the mining of lead and copper ores.

In Australia there is a falling off in the yield of silver, chiefly by reason of the severe drought which interrupted operations for several months at Broken Hill, in New South Wales. In Canada the production comes mainly from British Columbia, where a falling off is recorded, from 2,928,000 oz. in 1902 to 2,375,000 oz. in 1903. This decrease is due to the depressing influence of the local market for lead; even the silver contained in dry ores suffers from the lessened output of the lead required for its economical smelting, and until the good effects of the Canadian bounty on lead become apparent, the mining of silver in British Columbia will languish.

On the whole, it is becoming more evident each year that the silver production of the world is increasingly a by-product in the winning of the other metals, and this tendency will be further marked in the course of time, unless there is a radical change for the better in the market price of the white metal, as seems in no way likely.

THE PRODUCTION OF GOLD IN THE WORLD.

Countries.	1901.	1902.	1903.
North America—			
United States	$78,666,700	$79,992,800	$74,425,340
Canada	24,462,222	20,741,245	19,500,000
Newfoundland	43,613	82,680	43,000
Mexico	10,329,316	11,293,524	12,550,000
Central America	875,000	1,550,000	1,600,000
South America—			
Argentina	43,655	60,000	50,000
Bolivia	150,000	150,000	150,000
Brazil	2,762,248	3,036,381	2,800,000
Chile	450,000	500,000	575,000
Colombia	2,070,000	2,100,000	2,000,000
Ecuador	262,500	275,000	250,000
Guiana (Br.)	1,902,301	1,829,137	1,625,000
Guiana (D.)	500,276	390,498	375,000
Guiana (Fr.)	2,094,698	2,392,428	2,100,000
Peru	1,661,234	1,850,000	1,750,000
Uruguay	32,799	33,237	35,000
Venezuela	800,000	600,000	600,000
Europe—			
Austria	30,970	4,652	5,000
Hungary	2,189,724	2,165,000	2,150,000
Germany	59,814	62,472	62,000
Italy	2,725	10,270	10,200
Norway	2,658	2,500	2,500
Portugal	1,323	1,300	1,000
Russia	25,911,744	24,460,044	24,000,000
Spain	10,645	10,000	10,000
Sweden	41,671	62,500	62,500
Turkey	30,571	30,000	30,000
United Kingdom	107,267	63,105	50,000
Africa—			
Transvaal	4,939,944	35,250,155	61,527,231
Abyssinia	700,000	700,000	700,000
Rhodesia	3,074,730	3,573,822	4,146,250
Soudan	55,826	50,000	50,000
West Coast	620,100	400,000	350,000
Madagascar	544,282	575,000	700,000
Mozambique	255,840	150,000	150,000
Asia—			
Borneo (Br.)	250,000	275,000	275,000
China	3,000,000	5,500,000	6,000,000
East Indies (D.)	566,875	657,306	550,000
India (Br.)	9,422,855	9,683,798	11,118,820
Japan	1,647,998	1,600,000	1,700,000
Korea	2,300,000	3,500,000	4,000,000
Malay Peninsula	379,037	375,000	350,000
Australasia	77,174,268	82,454,344	88,170,909
Other countries	450,000	450,000	450,000
Totals	$260,877,428	$298,943,198	$327,049,750

THE COMMERCIAL MOVEMENT OF GOLD AND SILVER.

The production of gold in the world in 1903 has been shown approximately in the preceding pages. In a general way it may be said that the intensive activity of business during the year in the United States and the growing prosperity in Europe has absorbed an unusually large proportion of the gold product; that is, the proportion which has passed into actual circulation, or into use as a basis or reserve for paper currency has been greater in all probability than for a number of years past.

The exchange, or movement of gold, between different countries has not, however, been very much greater than in the previous year. The United States has attracted to itself probably more gold from outside than almost any other country, and the movement this way has been of considerable proportion.

The imports and exports of gold in the United

States for the 11 months ending November 30 were as follows:

	1902.	1903.	Changes.
Exports	$33,177,479	$42,882,178	I. $9,704,699
Imports	42,006,681	48,027,051	I. 6,020,370
Excess, imports	$8,829,202	$5,144,873	D. $3,684,329

In the month of December there was a considerable movement of gold from Europe to this country. The amount taken in foreign markets for shipment to the United States in December approximated $12,500,000, which must be added to the imports as given above for the 11 months. A movement of this proportion in the last month of the year is very unusual. There is every prospect that it will continue into the early part of 1904.

The Treasury Department estimates the total amount of gold coin, and of bullion in treasury, on January 1, 1904, was $1,314.622,524. Of this amount the accumulation in the treasury was no less than $686,651,991, being the largest accumulation of gold anywhere in the world. Of this great amount the treasury held as part of its current assets $265,571,972, while $421,080,019 was held as equivalent to outstanding gold certificates in circulation. The amount estimated as in circulation, or in the hands of the people, was $627,970,533. Only a comparatively small part of this, however, is in actual circulation, by far the greater part being held in bank reserves and otherwise as a basis of circulation. It seems probable also that the estimate is rather a high one, not sufficient allowance having been made for losses, accidental destruction, and gold coin used by jewelers and the like.

The total amount of money of all kinds in circulation in the United States on January 1, 1904, as estimated by the Treasury Department, was $2,466,345.897. This is an average of $30.38 per capita.

The gold movement in Great Britain for the 11 months ending November 30 was as follows:

	1902.	1903.	Changes.
Imports	£19,183,357	£25,469,642	I. £6,286,285
Exports	13,570,898	23,845,883	I. 10,274,985
Excess, imports	£5,602,459	£1,623,759	D. £3,988,700

The exports in 1903 formed an unusually large proportion of the imports. There has been no year within a considerable period, when the net imports of gold into Great Britain were so small.

The movement of gold in France for the 10 months ending October 31 is reported as follows:

	1902.	1903.	Changes.
Imports	Fr. 353,489,000	Fr. 289,231,000	D. Fr. 64,258,000
Exports	59,782,000	103,288,000	I. 43,506,000
Excess, imp.	Fr. 293,707,000	Fr. 185,943,000	D. Fr. 107,764,000

The Bank of France has parted with some portion of its gold reserve as shown in the tables below:

The accumulation of gold by the great European banks has comparatively come to an end, for the present at any rate, the only increases shown being in balances which are really government reserves.

The following table shows the gold holdings of the leading banks of the world at the dates nearest the end of 1903 covered by their reports. The amounts are reduced to dollars and comparison is made with the holdings at the corresponding date in 1902:

	1902.	1903.	Changes.
N. Y. Ass'd.	$153,744,300	$161,151,800	I. $7,407,500
England	143,748,940	141,513,580	D. 2,235,360
France	508,545,000	476,353,665	D. 32,191,335
Germany	160,790,000	165,210,000	D. 4,420,000
Spain	71,895,000	72,680,000	I. 785,000
Netherlands	23,406,000	20,941,500	D. 2,552,500
Belgium	15,460,000	16,116,665	I. 676,665
Italy	83,570,000	106,580,000	I. 23,010,000
Russia	377,785,000	411,455,000	I. 33,670,000
Austria	233,145,000	234,145,000	I. 1,000,000

The only notable increases are in Italy and Russia, and in both those countries the gold held is chiefly on government accounts.

Gold shipments from Australia for the 11 months ending November 30 are reported as follows:

	1902.	1903.	Changes.
Melbourne	£3,173,244	£4,249,016	I. £1,075,772
Sydney	2,717,913	4,217,948	I. 2,000,035
Adelaide	.....	100,000	I. 100,000
Fremantle	5,526,697	6,885,807	I. 1,359,110
Total	£11,417,854	£15,452,771	I. £4,034,917

Of the gold shipped this year, £7,813,401 went to India, £1,600,000 to South Africa, £257,157 to Hong Kong, £1,500,000 to San Francisco, and £29,619 to New York, the balance going to Great Britain.

The movement from Australia to India is an unusual one, so far as its dimensions are concerned.

Silver.—The production of silver in the world has, during the year, remained nearly stationary, and an unusual amount of the metal was taken last year for currency purposes, and, in all probability, there was a large use of the metal in the arts, as is common in prosperous times. The price of silver showed a substantial recovery during the year from the low point which was reached at the end of 1902. The average prices of silver per ounce troy in New York and London, are shown in the following table:

Monthly Average Prices of Silver.

	New York.		London.	
Month—	1902.	1903.	1902.	1903.
January	55.56	45.57	25.62	21.98
February	55.09	47.89	25.41	22.11
March	54.23	48.72	25.00	22.49
April	52.72	50.56	24.34	23.38
May	51.31	54.11	23.71	24.89
June	52.36	52.86	24.17	24.29
July	52.88	53.92	24.38	24.86
August	52.52	55.36	24.23	25.63
September	51.52	58.00	23.88	26.75
October	50.57	60.36	23.40	27.89
November	49.07	58.71	22.70	27.01
December	48.03	55.375	22.21	25.73
Year	52.16	53.45	24.09	24.75

Exports and imports of silver in the United States for the 11 months ending November 30 were, in commercial value:

	1902.	1903.	Changes.
Exports	$43,726,079	$34,119,689	D. $9,606,390
Imports	23,701,649	21,895,853	D. 1,805,796
Excess, exports	$20,024,430	$12,223,836	D. $7,800,594

It is probable that the actual exports exceeded those given above, as we are informed that in some cases exports of Mexican silver refined in this country in bond were not included in the table of exports, although the bullion appeared in the imports.

Exports and imports of silver in Great Britain for the 11 months ending November 30 were as follows:

Imports	£8,448,788	£8,954,969	I. £506,181
Exports	9,332,049	9,927,017	I. 594,968
Excess, exports	£883,261	£972,048	I. £88,787

Of the silver imports this year, £6,852,359, or 76.3 per cent of the total, were from the United States.

Exports and imports of silver in France for the 10 months ending October 30 were, in value:

Imports	80,306,000	105,722,000	I. 25,416,000
Exports	90,770,000	82,155,000	D. 8,615,000
Excess	E. 10,464,000	I. 23,567,000	.....

The imports of silver showed an excess over the exports for the first time in a number of years.

Shipments of silver from London to the East for the year up to December 17 are reported by Messrs. Pixley & Abell's circular as follows:

	1902.	1903.	Changes.
India	£6,109,000	£6,906,830	I. £797,730
China	203,800	310,060	I. 106,260
Straits	932,470	796,879	D. 135,591
Total	£7,245,370	£8,013,769	I. £768,399

The increase in shipments to India was due to the improved condition of that country. In 1903 crops were generally good, and there was none of the distress and famine which have prevailed in several sections for several years past. The Chinese shipments still show that the trade in that country is in a disorganized condition. Shipments to the Straits were limited in the latter part of the year, owing to action of the Straits on the monetary questions.

In October the Government of the Straits Settlement issued an order prohibiting further import of dollars into the colony. This was the preliminary step to placing the currency of the Straits upon a gold basis, which was agreed upon some time previously. The plan proposed was to prohibit, as soon as possible, the further currency of Mexico and Bombay dollars and to coin a special dollar for the Straits, which it is proposed to maintain at a par of 2s.—or 48c.—by making it exchangeable for gold when presented at the mints. The preliminary step, by limiting the present currency until the new coins appear, was expected to maintain the exchange value of the dollar at the point indicated. A difficulty presented was that, in anticipation of such an order, local traders and banking houses had been importing a very large quantity of Mexican dollars, and the banks at Singapore were loaded with these coins. Exports of these dollars to China served to limit shipments of silver from London.

An important point in silver during the year was the action of the United States in establishing a monetary standard for the Philippines. The new currency is established on a gold basis, that is, the coins issued are redeemable in gold when presented in large amounts. The currency, however, is of silver, as being best adapted to the needs of the inhabitants, the unit being a silver peso, or dollar, which is to be kept at a value of 50c. United States currency in gold. The coins provided are silver pieces of one peso, 50 centavos, 20 centavos and 10 centavos, the centavo being one one-hundredth of a peso. The minor coins are five-centavo pieces of nickel, one centavo and one-half centavo of copper.

The Philippine coins executed at the United States Mint during the year were as follows:

Coins:	Pieces.	Value, in pesos.
Pesos	14,155,017	14,155,017.00
50-centavo	3,104,177	1,552,088.50
20-centavo	5,505,427	1,101,085.40
10-centavo	6,305,216	630,521.60
Total silver	29,069,837	17,438,712.50
Five-centavo	8,912,558	445,627.90
One-centavo	10,792,558	107,925.58
One-half centavo	12,086,558	60,432.79
Total nickel and copper	31,791,674	613,986.27
Total	60,861,511	18,052,698.77

The work done in Mexico during the year towards establishing a currency of more stable values has been referred to in our columns in previous issues. Parallel with this has been the work of the commission, appointed by the United States, to devise measures for maintaining a stable rate of exchange with silver-using countries, such as Mexico and China. While no actual results have been obtained so far, the two commissions have met with favor and approval from most European nations, and something will probably be accomplished during the new year.

Coinage.—The coins struck at the United States Mints during the year, for circulation in the United States, were as follows:

Denomination—	Pieces.	Value.
Double eagles	1,241,428	$24,828,560.00
Eagles	776,697	7,766,970.00
Half eagles	2,082,024	10,410,120.00
Quarter eagles	201,257	503,142.50
Louisiana Exp. dollars	175,178	175,178.00
Total gold	4,476,584	$43,683,970.50
Standard dollars	10,343,755	$10,343,755.00
Half dollars	6,299,527	3,149,763.50
Quarter dollars	14,206,064	3,551,516.00
Dimes	28,294,055	2,829,405.50
Total silver	59,143,401	$19,874,440.00
Five cents	28,006,725	$1,400,336.25
One cent	85,094,493	850,944.93
Total minor	113,101,218	$2,251,281.18
Total coinage	176,721,203	$65,809,691.68

In addition to this work, the Mint executed 29,069,837 silver pieces and 31,791.674 nickel and copper coins; a total of 60,861,511 pieces, for the Philippine Islands. It also made 1.800,000 silver pieces for Venezuela, and 630,000 copper coins for Costa Rica. This makes a total of 240,182,714 coins struck during the year.

Tuff is from the Italian *tufa*. Many words used in connection with volcanic action are of Italian derivation, because those who have studied the great object-lesson afforded by Vesuvius have found it convenient to introduce the terms used by Italian scientists.

Florissant and the Pike's Peak region generally are celebrated for specimens of topaz. W. S. Stratton, the discoverer and former owner of the Independence mine, was prospecting for cryolite, as a source of aluminum, just previous to his first trip to Cripple Creek.

COPPER IN 1903.

The early estimation of the production of copper in the United States for 1903 is a matter of unusual difficulty. The policy of secrecy adopted by some large consumers, and the absence of the useful monthly statements formerly issued by the Producers' Association, deprives us of guides which have, in the past, enabled us to make very close estimates of the totals. We are compelled to rely upon such information as can be obtained from producers, coupled with a general knowledge of conditions in the leading mining districts, and such other indications as outside sources can supply.

With all these difficulties considered, an estimate approximating as closely as possible to the facts would be as follows, in long tons of 2,240 lb. each:

Production from domestic ores	299,500
Net imports, after deducing re-exports of foreign material	66,100
Stocks, January 1	64,690
Total supplies	430,290
Estimated home consumption	216,000
Exports in all forms	138,883
Total deductions	354,883
Stocks, December 31	75,407

Of the production from domestic ores, approximately 33.7 per cent was from Montana; 29.7 per cent from Michigan; 22.3 per cent from Arizona; 9.1 per cent from other Western States; 3.9 per cent from the East and South; and the remaining 1.3 per cent was copper in copper sulphate produced as a by-product in refining and not reduced to metallic form.

The total increase in estimated production over 1902 was approximately 8.2 per cent.

The actual imports of copper for 11 months, as reported by the Bureau of Statistics of the Department of Commerce and Labor, were as follows, the figures given being in long tons:

Copper in pigs, bars, etc.	56,525
Copper in ores and matte	7,512
Total imports	64,037
Re-exports of foreign copper in all forms	4,927
Net imports	59,110

Of the fine copper imported in the 11 months, 36,861 tons came from Mexico, 6,104 tons from Canada and 8,027 tons from Great Britain. Of the ores and matte, 34,105 tons, containing 5,958,010 lb. copper, came from Mexico; and 216,275 tons, containing 9,649,593 lb. copper, were from Canada. The imports from Mexico are chiefly copper bullion and matte, while those from Canada are largely ores.

The actual exports for 11 months, as reported by the Bureau of Statistics, may be given as follows, in long tons:

Copper, in bars, ingots, etc.	121,429
Copper in ores and matte	3,454
Total, 11 months	124,883

The December exports are not yet officially reported, but are known to be by far the largest of the year, as shown by the estimate above.

The estimate of consumption given may appear high, in view of the conditions prevailing toward the end of the year. It must be remembered, however, that during the first half of the year the requirements of manufacturers were on the largest scale ever known; while this condition really extended well into the second half of the year. The falling off in the last quarter was, perhaps, more apparent than real. New orders to manufacturers were slow in coming in, but many of them were busy on old contracts, and it does not appear that the falling off in actual consumption was very great.

As to production, it may be said that the output in Montana shows a decrease, owing to continued litigation, and to the three weeks' stoppage of the mines and works controlled by the Amalgamated Company. In the Lake district there was a large increase, due in great part to the opening of the new mines on the South Range. In Arizona, while the United Verde production was restricted, there was a marked increase in other mines, and several new mines are included in the list of producers. Utah showed a gain, and in several other districts there was also an improvement, notably in Tennessee, in the Ducktown district.

Our nearest neighbors, Canada and Mexico, showed considerable increases in production. In Canada the gain came largely from the active exploitation of the low-grade ores of the Boundary district in British Columbia. In Mexico the increase was from the rich deposits of Cananea and Nacozari, which are controlled by American capital.

Outside of North America nearly all the leading producers showed some advance. In the following table we present the figures of foreign production for 1901 and 1902, as given by 'The Mineral Industry,' with approximate estimates for 1903:

	1901.	1902.	1903.
Canada	18,282	17,486	21,750
Mexico	33,813	40,000	48,500
Newfoundland	2,756	2,586	2,200
Chile	30,805	28,930	31,000
Other South America	12,300	10,240	10,350
Spain	53,621	49,790	51,000
Germany	21,720	21,605	22,050
Other Europe	18,331	19,170	19,800
Japan	27,475	29,775	31,150
Australia	30,875	28,640	28,700
South Africa	6,400	4,450	4,650
Total	256,378	252,672	271,150

These estimates give a total production of copper in the world in 1903 of 570,065 long tons, of which the United States supplied 52.5 per cent. The total increase was 45,000 tons, or about 8.5 per cent. Outside of Mexico, there were no marked changes.

The only large copper discoveries reported last year were in Rhodesia; but the value of these still remains to be proved, and it is quite possible that the reports are greatly exaggerated.

The present prospect is that the demand for copper will continue very large, and that there will be a steady increase in the production; though not, to any great extent, in advance of the demand.

In the following pages will be found reports from the leading copper producing districts, in which local conditions are carefully treated.

THE NEW YORK COPPER MARKET.

The year has been a fairly prosperous one for the copper industry of the United States. At no time did values go below the average price of the preceding year. On the other hand, there were at times sudden and wide fluctuations, mostly caused by the erratic policy pursued by leading producers. In how far the interests of the trade have been subordinated and sacrificed to operations in share speculations is a question often asked, but difficult to answer.

Production during the year under review will probably show an increase over 1902, mostly as the result of a larger output at the Lakes and in Arizona, although the latter suffered somewhat from labor troubles, insufficient water supply and a lack of fuel during the Colorado coal strike. In Montana, continued litigation between the Amalgamated Copper Company and the United Copper Company acts as a check to a further development of the industry in that State.

As to consumption, the closing months of 1902 found many works shut down or running on half time in Europe, leaving a growing army of unemployed workmen. In contrast, the volume of business in the United States surpassed all precedents.

At the end of this year, we find an unprecedented demand from Europe, while over here consumption shows a falling off during the last few months, in sympathy with the depression in the iron and steel trade. Generally speaking, however, as far as the first seven or eight months of the year are concerned, business in all lines was very good. There would no doubt have been an actual scarcity of the red metal if the disturbance in the financial markets had not caused a general curtailment of purchases and a putting off of new enterprises. As it is, the use of copper for traction purposes is increasing all the time, and the trials in utilizing electrical power for long distance travel continue to give very encouraging results.

The production of sulphate of copper again absorbed fair quantities of the raw material.

The market in January opened rather active, with lake quoted at 12c., electrolytic at 11¾, casting copper at 11½c. Circulars and statistics, widely distributed on both sides of the Atlantic, announcing that enormous stocks had accumulated in the United States, were generally discredited. On the contrary, the trade began to recognize the stronger position of the metal, and consumers as well as speculators bought freely.

Toward the end of January 12½ was paid for lake and 12⅜ for electrolytic copper.

During February the improvement made further progress, manufacturers both here and abroad being exceedingly busy. Very soon 13c. was reached, while at the beginning of March prices had advanced to 13½. The strong consumptive demand continued unabated throughout the greater part of April, carrying prices to 15c. for lake and 14¾c. for electrolytic copper.

During all this time, early deliveries were difficult to obtain, producers being well sold ahead, and it was not until the latter part of April that a reaction set in. Influenced by a pronounced weakness in the London speculative market, consumers began to curtail purchases and business became more or less restricted. Prices gave way slowly, lake being obtainable at 14¾ and electrolytic at 14½ cents.

Throughout May, both consumers and producers continued a waiting attitude, but at the beginning of June the market became rather flat, caused by the weak tendency of the stock exchange, as well as rumors of impending labor troubles. By the end of the month, lake had declined to 14¼ and electrolytic to 14c. per pound.

Renewed liquidation on the stock exchanges, which undermined confidence to a large degree, was the main cause of a further drop of 1c. per lb. during July. Even the settlement of the various building strikes had no effect whatsoever, consumers proceeding very cautiously and covering only their immediate requirements.

The month of August opened with lake selling at 13c. and electrolytic at 12¾, at which figures a fair volume of business was transacted. Stimulated by a decided improvement in the financial markets, consumers toward the end of the month again bought freely, values advancing slowly from week to week until 13½ for lake and 13¼ for electrolytic was reached by the middle of September.

Dulness reigned supreme during the greater part of October, quotations declining to 12¾ for lake and 12½ for electrolytic, until at the end of the month it was found that all the mines and smelting works of the Amalgamated Copper Company in Montana had been shut down in order to bring about new legislation in that State. Naturally, this action caused a sensation. Consumers being covered only for their immediate requirements, rushed in to buy and values advanced by leaps and bounds, up to 13¾ being paid for lake and 13½ for electrolytic.

On November 11, operations were all at once resumed and prices immediately started to go down, the month closing dull, with lake selling at 12½ and electrolytic at 12⅜ cents.

Under heavy selling pressure by leading producers there was a further decline at the beginning of December to 11¾ to 12 for lake and 11½ to 11¾ for electrolytic copper, which greatly puzzled the trade on this side. It seems, however, that manufacturers in Europe who were practically bare of supplies, and where business shows a considerable improvement, took advantage of the opportunity to a large extent, and bought heavily for early, as well as future delivery. Thus it came about that when the home consumers finally entered the market they had to pay higher prices.

The year closes with lake quoted at 12⅛ to 12¼; electrolytic, 12 to 12⅛; casting copper, 11⅝ to 11¾c. per pound.

Owing to the withdrawal of the largest factor from the Producers' Association, it has become rather difficult to gather reliable statistics. In well-informed quarters, however, it is not believed that more than normal stocks of refined copper exist in this country. If left subject to the natural laws of

supply and demand, the market will no doubt show a healthy development during the coming year.

The average monthly prices of copper in New York were as follows, the figures being in cents per pound:

Average Monthly Prices of Copper in New York.

	Electrolytic.		Lake.	
Month.	1902.	1903.	1902.	1903.
January	11.053.	12.159	11.322	12.361
February	12.173	12.778	12.378	12.901
March	11.882	14.416	12.188	14.572
April	11.618	14.454	11.986	14.642
May	11.856	14.435	12.226	14.618
June	12.110	13.942	12.360	14.212
July	11.771	13.094	11.923	13.341
August	11.404	12.962	11.649	13.159
September	11.480	13.205	11.760	13.345
October	11.449	12.801	11.722	12.954
November	11.288	12.617	11.553	12.813
December	11.430	11.952	11.599	13.084
Year	11.626	13.235	11.887	13.417

The average price of electrolytic was higher by 1.609c. in 1903 than in 1902; while the lake average showed an increase of 1.630c. last year. The price of electrolytic approached that of lake very nearly, the difference in the yearly average being only 0.182c. per pound.

THE LONDON COPPER MARKET.

BY OUR SPECIAL CORRESPONDENT.

January opened with a total visible supply in Europe, and afloat thereto, of 16,540 tons, while the actual stocks in England and France were only 11,215 tons, the price for standard copper being about £53 5s. for cash, and £53 12s. 6d. for three months. During the early part of January great activity was noticeable in England, Germany and the United States, manufacturers being full of work, and with every prospect of good trade. India was also buying manufactured copper with great freedom, and the year commenced with a very promising outlook, the price for standard copper improving to £54 5s., cash, £54 12s. 6d. three months; but when everything was at its most satisfactory level there was a communication, received by leading dealers and people interested in copper, from interested parties in America, stating that stocks on that side had accumulated to a very large extent, and predicting a speedy decline in values. This caused a certain amount of selling by bears, and unsettled trade with consumers, so that before the middle of the month prices had been forced down to £52 15s., cash, and £53 for three months. Refined copper was scarce, and most of the European producers were holding for high prices. Towards the end of the month further gloomy reports were cabled from America, and this had a temporary effect of stopping buying, but the large demand for sulphate and manufactured copper had to be met, so that values rose again to £55 for cash and forward metal.

February saw a reduction in the total visible supply of 15,131 tons, while the amount of spot copper in Europe was only 9,356 tons. Prices during this month steadily advanced, owing to the very large trade that was forthcoming from all parts of the world. The Americans had to raise their prices, and even as they advanced them, orders continued to roll in. When, however, the price of standard had risen to £58 5s. for cash and near dates, the market was again treated to further pessimistic predictions, which for the time being again checked the upward movement, and brought about a fall in the price of copper shares, which in turn re-acted upon the copper market. But the enormous business that was doing again asserted itself, and prices once more took a jump, so that by the end of the month we had reached £59 7s. 6d. for cash and £59 10s. for three months. The consumption in America was on an exceedingly large scale, and most of the producers were practically sold out for some time.

March commenced with a further shrinkage in stocks, which were 7,922 tons, the visible supply standing at 13,472 tons. With a few fluctuations the market quickly advanced to £67 5s. for April and May dates, this being caused by heavy bear covering which was induced by the continued large consumers' demand for copper in America. When the bears' most urgent needs had been covered there was a natural re-action, and prices dropped away, until just before the end of the month they had fallen to £63. At this point there was a fresh start, and the month closed with £65 as the nearest figure for both positions. Consumers continued to buy on a very large scale until prices of Standard commenced to decline, and then, as usual, took fright, and refrained from buying further. There being very little copper available for shipment from America enabled European producers to sell their productions at very full prices, compared with standard values.

April opened with a slight increase in stocks, which amounted to 8,059 tons, the visible supply being estimated at 14,384 tons. Copper shares were greatly affected in London, owing to the heavy fall in the price of consols and other high-class securities, and the American share market also becoming somewhat demoralized helped to depress the price of copper. But the fall was principally confined to standard brands, and not to the copper required by consumers, and it was possible for Chile bars to be shipped from warehouse on this side to the United States for conversion into electrolytic. The price for standard, however, dropping to about £60 10s. for cash, encouraged a good amount of speculative buying, which caused a quick improvement again to £63 5s., but realizations quickly followed, and once more caused a speedy decline in prices, so that by the end of the month £59 2s. 6d. had been accepted for cash and three months.

In May, notwithstanding the large demand that had been taking place, stocks again increased to 9,023 tons, the visible supply being 15,998 tons. Further bear raids were indulged in, and, owing to the apathy on the part of buyers, prices were driven down. The lower level, however, brought in some speculative demand, and under this and bear covering there was a rally to £61 2s. 6d. More American reports were then forthcoming as to possible reductions in producers' prices, and this caused a further shrinkage, but when consumers found that this reduction was not being made the tone became somewhat firmer, and prices advanced to over £63 per ton. The very contradictory reports that were put about naturally tended to make consumers shy, and they were only buying their hand-to-mouth requirements. The chief European producers were again able to market their output at a high level, owing to the full prices asked in America. India came in and bought fairly, but reports from America were not quite so satisfactory, and business showed some signs of getting quieter in that direction.

The total stocks in Europe at the beginning of June were 8,589 tons, the visible supply being 15,764 tons. The month opened with all the markets in America, both Stock Exchange and trade, in a very disorganized state; violent falls occurred in the chief copper shares, and large lines were thrown on the market to provide cover against other speculative commitments. This caused a rapid fall to take place in the price of standard, which dropped to £55 12s. 6d., cash, and £54 17s. 6d. three months, but owing to the bear account again being somewhat large, and the available stock being well held, prices recovered again before the end of the month to £58 5s., cash, and £58 three months. During this month the United Metal Selling Company made the long-expected cut in prices, but although it was able to sell good quantities in its own country, the consumptive demand here was only on a small scale, buyers not having sufficient confidence in the general position to tempt them to buy ahead.

July commenced with a slight increase in stocks, but a decrease in visible supply which on July 1 stood at 8,903 and 15,303 tons respectively. The lower prices ruling stimulated trade with consumers in America, the United Metals Selling Company, the Calumet & Hecla and other producers meeting the demand at from 14 to 13.25c. Trade on this side remained very quiet until towards the end of the month, when good purchases were made by India and by sulphate makers. The speculative market opened at £58 5s., cash, and £58, three months, but owing to the collapse of the American stock markets values declined to £56 5s. cash. When it was found that warrants were going into one channel, and were scarce for early delivery, there was a bear flurry, which prevented the market from going to pieces altogether, and although forward prompts fell to £54 15s., cash and near dates remained practically unaffected, and a backwardation of nearly £2 for three months was established.

At the beginning of August the statistics were more favorable, stocks having decreased to 8,749 tons, and the visible supply to 14,949 tons. This fact, together with better reports from America, caused a renewed consumptive demand and considerable bear covering. The standard market, amidst great excitement, saw a fresh advance, spot at one time rising to £60 15s. with three months selling at £59 7s. 6d. Later on inactivity became the order of the day, and prices dropped to £58 and £57 10s. respectively. Very large sales were made in America and Europe of all classes of consumers' copper, and most of the principal producers were able to sell their make for this and the following month.

September saw stocks higher, at 9,412 tons, the visible supply being given as 15,712 tons. The standard market was adversely affected by the advance in the Bank of England rate of interest and renewed unsatisfactory American news, so that standard values declined to £55 all positions. The market for consumers' copper improved somewhat at the lower level, America buying Chile bars for shipment to the United States and sulphate makers paying high premiums for all suitable material.

October saw a decrease again in stocks, which stood at 6,041 tons, and the visible supply at 15,241. The very unsettled commercial and financial outlook in America had the effect of causing consumers in the States to abstain from buying, and although the United Metals Selling Company reduced prices, very little trade was possible on this side, where manufacturers and speculators alike were frightened at the warlike news received from the East, where it looked as if trouble was brewing between Japan and Russia. When values of standard had been forced down to £53 12s. 6d. there was a quick recovery on the announcement that all the Amalgamated mines had been closed down, and to make it more definite, it was even reported that all the works and plant connected with the Amalgamated Company's properties had ceased to work, and that it was almost certain that months must elapse before work was resumed. There was some very large speculative buying on the strength of this news, and standard rose to £60 15s., sulphate of copper makers also taking large lines of suitable stuff. Chile at this time took advantage of the improved state of affairs to market a good quantity of metal.

November opened with an absolutely idle market, consumers having bought largely, and speculators looking on. Labor trouble in the American coalfields, and a strike at the Rio Tinto mines in Spain were the best bull points obtainable. But suddenly the market received a shock, by the receipt of news from America that all the Montana properties had re-commenced working, and this forced a decline to £55 10s. for standard. A day or so after this news, the Rio Tinto strike collapsed, and the market being shorn of all good news, quickly gave way under bear selling and realizations until £53 12s. 6d. was accepted. These violent movements naturally choked off consumers, and it was only owing to the scarcity of cash warrants, and all available near delivery material, that prices did not suffer to a greater extent. India commenced to buy at the lower range, and took fair lines of manufactured copper.

December opened at £54 15s. for cash, and £54 for three months, and remained a fair market notwithstanding the pressing offers of all kinds of refined American brands that were being sold in large quantities in Europe and this country by the United Metals Selling Company, and also by other large

American producers. This large selling was caused by the continued apathy on the part of the American consumers, so that the producers, who wished to make sales, had to dispose of their goods in the European market, where buyers were tempted by the continuous decline in price. When the lowest level had been established, there was a quick movement in the upward direction, and it was found that American buyers were willing to enter the market. At one time the margin between standard and refined got exceedingly narrow, and electrolytic could have been bought at almost the net standard price. The closing quotations of the year are £57 for spot standard, £56 12s. 6d. for three months.

The average monthly prices of estimated copper—equivalent to the former G. M. B.'s—in London were as follows, in pounds sterling per long ton of 2,240 pounds:

Average Monthly Prices of Standard Copper in London.

Month.	1902.	1903.	Month.	1902.	1903.
January	£48.43	£53.52	July	£52.89	£56.64
February	55.16	57.34	August	51.96	58.44
March	53.39	63.85	September	52.68	56.82
April	52.79	61.72	October	52.18	55.60
May	54.03	61.73	November	51.08	56.30
June	53.93	57.30	December	50.95	56.36
Totals				£52.46	£57.97

The minimum price was in January and the highest point of the year was reached in March. In the last four months of the year the variations were not large.

COPPER MINING IN THE SOUTHWEST.

By JAMES DOUGLAS.

The copper industry of southern Arizona during the year 1903 has been active and prosperous. The older companies have maintained their production, and of the new companies the Calumet & Arizona Mining Company, the Shannon Copper Company and the Black Diamond have increased their output. If the two copper works in northern Sonora near the American line, whose output reaches the American market over American railroads, be included in the copper production of the Southwest, the total production during the year 1903 is approximately 80,000 tons. Of this amount about 26,000 tons is due to the production of the Greene Consolidated Copper Company and the Moctezuma Company in Sonora. The United Verde is not included; the production is supposed to be normal, and improvements at that mine aim at giving greater facilities for hoisting and handling ore, and counteracting the damage done by the fire which has for years retarded operations.

The production of the Old Dominion mine has been turned out principally in the form of high-grade matte. As the Old Dominion is erecting new smelting works with a converter department, its production in the near future will reach the market, like that of all the mines of the Southwest except the Black Diamond, in the form of bessemer bars. More radical improvements are being made by the Old Dominion, both in the mining and smelting departments, than by any other of the older companies, with a view of raising the production to approximately 2,000,000 lb. per month.

In the Bisbee district there has been great activity, some two dozen companies outside the Copper Queen being engaged in more or less active development. The only one of these companies which is increasing the Arizona production is the Calumet & Arizona, whose smelting works at Douglas have turned out approximately 12,000 tons in 1903. But another new company, the Lake Superior & Pittsburg, which bought the property of the South Bisbee Company, has encountered a large body of oxidized ore on the 1,000-ft. level, and will probably add somewhat to the production of 1904. The large Douglas works of the Copper Queen Company will be in operation before the year closes, but though their capacity will approach 2,000 tons a day when running full, their supply will be drawn not only from the property of the Copper Queen mine, but from the Moctezuma Copper Company's mine in Sonora, the United Globe mines, and other properties controlled by the same owners. They will also be used as custom works for the smelting of copper and dry gold and silver ores, but not of lead.

In the Clifton district the Shannon Company has almost steadily increased its output, which has attained an average of nearly 500 tons a month. The Detroit Company and the Arizona Copper Company have shown no inclination to increase their output notably. The Standard Company has been a steady producer of high-grade ore, which is handled by the Arizona Copper Company's smelter, and other mines in the same district are being developed, with the probability of maintaining, if not increasing, its productiveness. The ores, however, of Clifton and Morenci, where they exist in large quantities, are so lean, and involve so heavy an expenditure in works, and the margin of profit per ton is correspondingly so small, that any rapid increase of production from that region cannot be anticipated. On the other hand, the size of the ore-bodies is such that no signs of exhaustion need be anticipated in the near future. The prospects, therefore, are that the contribution from Arizona in 1904 will be slightly greater than in 1903, unless operations are curtailed by labor troubles, either in Arizona itself or in the coal mines whence Arizona draws her fuel supply, or by catastrophes which one cannot foresee.

LAKE SUPERIOR COPPER MINING IN 1903.

By OUR SPECIAL CORRESPONDENT.

The year 1903 was a satisfactory one to the Lake Superior copper mining industry. The price of copper, averaged considerably higher than the previous year, and production has shown a large increase over the record-breaking figures of 1902. A number of new mines have become producers and give good promise. Dividends increased nearly $1,250,000, while wages have remained at the same level as during a 17c. copper market and the number of men employed was never larger. The outlook for 1904 is bright, the mines are in excellent condition, and the coming year should see a material increase in production and dividends.

The following table gives the actual production of refined copper in pounds by Lake Superior mines for 1902, with estimates of the 1903 output. The official returns for 1903 will not be obtainable until the latter part of next summer, but they probably will vary only slightly from the estimates:

Mine.	1902.	1903.
Calumet & Hecla	81,248,739	79,700,000
Quincy	18,988,491	18,000,000
Osceola	13,416,396	16,200,000
Tamarack	15,961,528	14,000,000
Champion	4,165,784	12,000,000
Baltic	6,285,819	11,000,000
Trimountain	5,730,807	10,800,000
Wolverine	6,473,181	9,000,000
Mohawk	908,479	6,700,000
Atlantic	4,949,366	5,550,000
Franklin	5,259,140	5,500,000
Isle Royale	3,569,748	3,100,000
Mass	2,345,805	3,000,000
Adventure	606,211	2,950,000
Winona	101,188	1,200,000
Arcadian	500,000	180,000
Phœnix	.....	180,000
Michigan	133,373	150,000
Miscellaneous	.....	300,000
Totals	170,644,055	199,505,000

The credit for this year's great output largely belongs to the new mines. As will be seen from the table, the mines on the Baltic lode produced 33,800,000 lb. of ingot copper last year, more than double their output in 1902. These three South range mines—the Champion, Trimountain and Baltic—are now controlled by a single company. They are properties of great possbilities, and should show steady and consistent growth for many years. Another group of mines which is expected to show increased production is on the Kearsarge lode. This group at present consists of the North and South Kearsarge mines, branches of the Osceola Consolidated, and the Wolverine and Mohawk. All will increase their output in 1904, and the Centennial, which is developing a large mine on the same lode formation, will begin shipping next summer. Among the other new mines from which larger outputs may be expected in 1904 are the Isle Royale, Mass., Winona, Phœnix and Michigan.

Of the older properties, the Calumet & Hecla and Quincy will not show any marked increase, but both should make more copper than in 1903. Tamarack's outlook is better than it was a year ago. Atlantic and Franklin are now making a larger output than ever before, and have probably reached a maximum capacity, at least for 1904. It seems probable that the Lake Superior district will make 225,000,000 pounds of refined copper the coming year.

One of the notable developments of late years is the decline in the importance of the Calumet & Hecla as a producer, though this is more relative than actual. The mine was opened in 1866 and made more than half of the total production of the Lake district from 1870 to 1902, inclusive. It has produced about 55 per cent of all the copper made on Lake Superior and is now making about 12 per cent of the copper produced in the United States, or about 8 per cent of the world's output. Its relative importance will probably continue to diminish, owing to the larger output of other mines, even if it produces at its current rate.

The value of the output of the Lake district in 1903 is hard to determine, as market quotations do not always represent the figures at which the companies sell. Based on the current selling price for the year, the gross value was nearly $27,000,000 and the dividends from this amounted to $4,680,000, or about 17 per cent. Up to the end of 1903 the Lake Superior mines have produced approximately 3,179,395,770 lbs. of fine copper, which sold for $486,508,550. About 25 per cent of this amount has been returned to the shareholders of the mines in the form of dividends. In 1903 Lake Superior copper mines paid 3.8c. in dividends for every pound of metal produced.

The total dividends of Lake mining companies to date have been $122,015,920, and the assessments $49,638,700, leaving a credit balance of $72,377,220.

There were 15,150 men employed in the copper industry in the Lake district, not counting those in foundries, saw-mills, logging camps, etc. The increase of nearly 17 per cent in production made last year was effected by practically the same force as in 1902.

MELTING-POINTS AT HIGH TEMPERATURES.—W. Hempel, in *Zeitschrift für Elektrochemie*, IX, 850, reports the following determinations, which are probably a little below the true values: Bone ash, 1,450° C.; platinum, 1,670° C.; magnesite, 1,825° C.; alumina, 1,880° C.; lime, 1,900° C.; magnesia, 2.250° C. Berlin porcelain softened at 1,550° C., quartz at 1,670° C., and specially prepared Meissen porcelain at 1,850° C., or 180° higher.

GOLD IN MADAGASCAR.—It is reported that the production of gold in 1903 will show a considerable increase over previous years, the exports in September alone being valued at about $100,000. A new company has been formed in England for working mines in the western part of the island. The latest authentic statistics of gold production are for 1901, when the output was 819 kg., valued at $544,282.

GEOLOGICAL SURVEY OF INDIA.—The resolution of the Government of India on the report of the Geological Survey for the past official year says that in the field of economic inquiry definite and satisfactory results have been yielded by the investigations into the occurrence of coal in parts of the Punjab and near Shillong, in Assam; of chromite, in Baluchistan, and of iron ore in the Dhar Forest. Evidence has also been obtained of geological features favorable to the occurrence of petroleum in Burmah. The resolution continues that the geological department may be expected in the future to take an active part in the development of the country, as the exploitation of its mineral wealth is now proceeding at a constantly increasing rate.

LEAD IN 1903.

By W. R. INGALLS.

The production of lead in the United States from domestic ores in 1903 showed an increase of 3 per cent over that of 1902. Our figures for the year are based on returns received from producers, the December output being estimated. In the table below the output is given in short tons of 2,000 lb., comparison being made with the corrected statement for the previous year:

	1902.	1903.	Changes.
Desilverized lead	210,100	208,274	D. 1,826
Soft lead	70,424	80,756	I. 10,332
Total	280,524	289,030	I. 8,506

The production of desilverized lead includes that of hard, or antimonial, lead. The total production of antimonial lead in 1903 was 10,257 tons; but we are unable to say at present how much of this was from foreign ores.

In addition to the output from domestic ores, as given above, there was a total of 84,771 tons of lead made in the United States from foreign ores and base bullion; these ores were chiefly from Mexico.

Imports of lead into the United States in all forms, with re-exports of foreign lead, for the 11 months ending November 30, are reported by the Bureau of Statistics of the Department of Commerce and Labor as below; the figures are in short tons, of 2,000 pounds:

	1902.	1903.	Changes.
Lead, metallic	2,329	2,824	I. 495
Lead in ores and base bullion	94,585	95,669	I. 1,084
Total imports	96,914	98,493	I. 1,579
Re-exports	73,297	76,871	D. 3,574
Balance	23,617	21,622	D. 1,995

Of the lead imported in 1903, 86,507 tons were from Mexico and 8,547 tons from Canada. The balance shown above is not imported or consumed in this country, but is chiefly lead in course of treatment, which is held here in bond at different refining works. In addition to the re-exports, above given, there were exported in 1903, 56 tons of domestic lead, which compares with 3,239 tons exported in 1902.

The lead business of the United States is almost completely in the hands of the American Smelting & Refining Company and the Missouri producers. The former smelts nearly all of the silver-lead ore that is produced. It has certain affiliated mining interests; but, while being far from controlling all the mines, by direct or indirect ownership, it is able to dictate the production of the outside interests, by virtue of its possession of almost all the smelting capacity. The Selby Smelting & Lead Company, of San Francisco, and the Balbach Smelting & Refining Company, of Newark, N. J., are the only important concerns outside of the trust (which is one of the most perfect of the recent industrial organizations), and their field of operation is naturally limited. The Missouri producers, who have chosen to remain independent, produce non-argentiferous lead, which, for the most part, they both mine and smelt. They are content to conform to the price schedule established by the American Smelting & Refining Company. The latter does not attempt to peg the price of pig lead, but wisely raises and lowers it according to the demand, and, on the other hand, regulates the production of ore by establishing the price to be paid to the miner. The business is therefore governed perfectly, subject to the limitation of the price for lead in London and the necessary difference to prevent importations. The magnitude of the business and the profit in it are manifested by the reports of the company.

During the year ended April 30, 1903, the Smelting & Refining Company bought ore containing 1,025,132 oz. of gold, 63,389,438 oz. of silver, 246,480 tons of lead and 23,959 tons of copper. From the sale of metals it realized $82,985,442, out of which there was a profit of $9,403,711, or about 11.3 per cent of the total receipts. After deducting charges for general expenses, repairs, betterments and new construction, there remained a net balance of $5,421,103 on the year's business. With the exception of a small tonnage of pig lead in bond for export, the company had no stock of refined metal on hand April 30, 1903, save what was in the form of ore and base bullion. There were at that time in operation smelting plants with a capacity of 3,720,000 tons of ore per annum, and refineries with capacity of 340,000 tons of lead bullion and 36,000 tons of copper bullion per annum. There were held in reserve, fully equipped and in good repair, smelteries of capacity for 650,000 tons of ore per annum and refineries of capacity for 125,000 tons of lead bullion.

The policy of the American Smelting & Refining Company has been to concentrate its operations, and to this the increasing rate of its earnings is largely attributed. The great plant at Murray, Utah, was completed in 1902, and all the old works near Salt Lake were then abandoned. The Philadelphia plant at Pueblo and the plant at Argentine, Kan., were closed. In July, 1903, there was a strike at the two works at Denver, which compelled both to be closed, and the company decided then to abandon the Grant plant. In the meanwhile, the plants at Durango and Leadville, Colo., have been greatly improved. Also, the company has lately purchased the plant at Everett, Wash. Under the present system, a single large and economical plant is run at each important center. The bullion is shipped for refining either to Omaha, Chicago or Perth Amboy. Between the Atlantic and Pacific coasts, the only competitor with the trust for silver-lead ores is the Ohio & Colorado Smelting & Refining Company, a new concern, which has six blast-furnaces, of aggregate capacity for about 750 tons of ore per day, at Salida, Colo. Its ore supply is derived chiefly from Leadville. Additions were made to this plant in 1902. In Utah, however, the copper smelters are now taking a good deal of ore that formerly went to the Smelting & Refining Company, and there is prospect of further competition in that field.

In the Missouri districts, where the ore is turned out exclusively in the form of high-grade, non-argentiferous concentrates, the smelting is done by a variety of methods. Four of the smelters now operating in the Southeast have blast-furnace plants, one has reverberatory furnaces, and one has Scotch hearths. In the Southwest, Scotch hearths are used exclusively. In the Southwest the ore, which comes from a large number of small producers, is purchased by public smelters located at Joplin, Mo., and Galena, Kan., save in the case of the Granby Mining & Smelting Company, which has its own plant at Granby, Mo. In the Southeast, all of the important mining companies have their own smelters, while the small producers sell either to the larger ones or to the few public smelters who can afford to take ore from this market. Some ore is shipped to the Pennsylvania Smelting Company, at Pittsburg, Pa., and occasional lots go to the Balbach works, at Newark, New Jersey.

Three of the mining companies of southeastern Missouri have smelteries adjacent to their mines. The St. Joseph Lead Company, which also treats the ore of the Doe Run Lead Company, has a plant at Herculaneum, on the Mississippi river, part way between the mines and St. Louis. The other works are situated at or near St. Louis, and the tendency is to make that the principal smelting point. The lead has to go to St. Louis, and there is no difference in the cost of carriage, whether it go there in the form of ore or pigs, while taking it there in the form of ore saves the cost of sending the coal, coke and fluxes from St. Louis down to the mines.

During 1903 the large plant of the Federal Lead Company, at Alton, Ill., constructed in 1902, was got into good running order. All the ore from the Guggenheim interests is now smelted there, and the old plant at Cheltenham, purchased from the Missouri Smelting Company, has been closed. The smeltery connected with the Markle Lead Works, at Granite City, was operated during a portion of the year, but after the organization of the United Lead Company it was closed, the ore formerly received there being diverted to the Federal Lead Company, at Alton, an allied interest. The St. Joseph Lead Company made additions to its plant at Herculaneum in anticipation of the increased output of its mines in 1904. The National Lead Company, which for several years has been considering the erection of new smelting works, finally decided to build on the east side of the river, near East St. Louis, and its plant will probably be erected in 1904, after which the present plant at Cheltenham will doubtless be closed. Nothing has yet been given out as to the nature of the new works, but it is to be expected that it will be a modern Scotch-hearth plant, with bag-house attachment and blast-furnaces for working up the gray slag, much like the Federal plant at Alton.

The lead manufacturing business has become consolidated almost as thoroughly as the smelting business. The National Lead Company, organized upward of 10 years ago, acquired the majority of the corroding works in the United States, and has been for a long time the largest single consumer of pig lead. Besides white lead, it has manufactured red lead, litharge and orange mineral, and to some extent lead pipe and sheet lead. In 1898 one of its constituent companies, the St. Louis Smelting & Refining Company, acquired a large and valuable property at Flat River, in southeastern Missouri, and, after developing it on a grand scale, became a producer of pig lead, smelting the concentrates at the old works at Cheltenham, St. Louis, which, in former years, were run on silver-lead bullion from the West. The National Lead Company, in its manufacture of white lead, sticks to the old Dutch process. A few years ago the Bailey-Dutch process was taken up by a new concern, the Union Lead & Oil Company, backed by Messrs. Whitney, Ryan and Elkins, which also secured mining property in southeastern Missouri. This company planned to compete with the National, but its effect in the trade was not felt so quickly as was promised, although it is understood that the Bailey process proved fairly succesful in practice.

Late in 1902 the scheme was developed to combine the two companies, and at the same time bring all of the other manufacturers of lead products into the consolidation. This scheme was promoted by the Guggenheims, and in the early part of this year it looked as if it would be consummated, but after hanging fire for a long time it finally fell through because of a dispute with the interests controlling the National Lead Company. Immediately afterward the United Lead Company was brought out, taking over the Union Lead & Oil Company; the American Shot & Lead Company; the Markle Lead Works, of Granite City, Ill.; the Raymond Lead Company, of Chicago; Hoyt Metal Company, of St. Louis; Chadwick-Boston Lead Company, of Boston; the James Robertson Lead Company, of Baltimore, Md.; the Omaha Shot & Lead Works, of Omaha, Neb.; the Northwestern Shot & Lead Works, of St. Paul, Minn.; the Collier Shot Tower Works, of St. Louis, Mo.; the Bailey & Farrell Shot Works, of Pittsburg, Pa.; Gibson & Price, of Cleveland, O.; the Le Roy Shot & Lead Works, of New York; the Sportsman's Shot Works, of Cincinnati, O.; the Chicago Shot Tower Company, of Chicago, Ill.; Tatham & Brothers, of New York; the E. W. Blatchford Company, of Chicago; the Lanston Lead Works, of Chicago, and the McDougall White Lead Company, of Buffalo, N. Y. The Carter White Lead Company and the Picher Lead Company did not go into the consolidation.

The present situation in the lead-manufacturing business is, therefore, the existence of two great companies, which consume a large proportion of the pig-lead product, and a comparatively small number of independent manufacturers. The National Lead Company is the largest maker of white lead, red lead, litharge and orange mineral, and is also a producer of sheet lead and lead pipe. The United Lead Company controls, to a large extent, the manufacture of pipe, sheet, shot and the lead alloys, and is also a manufacturer of white lead. The National Lead Company mines and smelts a large portion of the pig lead it requires, while the United Lead Company obtains its supply from the American Smelting & Refining Company and the Federal Lead Company, with which concerns it is affiliated. The United Lead

Company is preparing to go more extensively into the white-lead business, for which purpose it has already begun the construction of a large plant at Granite City, Ill. This is likely to have an important effect on the white-lead trade, since the new production must go into consumption in some way, or displace a portion of the previous manufacturing capacity. A new plant for the manufacture of sheet pipe, etc., is being erected at Perth Amboy, N. J.

The consumption of white lead in the United States has not, in recent years, shown the increase that it should, in view of the general prosperity and great activity in building that there has been. This is doubtless due, to a large extent, to the inroads that the makers of zinc-white and barytes pigments have made into the trade. The production of both zinc-white and barytes has increased in a somewhat greater ratio than has that of white lead; and their competition is not to be considered lightly. It is still an open question as to whether white lead or zinc-white is the superior pigment; it is conceded that barytes alone is inferior to either, except for special purposes; but there is no doubt that barytes is a valuable ingredient to be used in connection with the others, and some authorities hold that the best all-around paint is a mixture of the three.

About 70 per cent of all the lead produced in the United States is derived originally from five districts —the Cœur d'Alene (Idaho), southeastern Missouri, Park City (Utah), Joplin (southwestern Missouri and southeastern Kansas), and Leadville (Colorado). The remainder of the output comes chiefly from other districts in the States of Idaho, Colorado, Utah and Missouri. The Cœur d'Alene, southeastern Missouri and Park City have resources which permit of a largely increased output, and the tendency is toward a greater production from those districts when market conditions are favorable, as they were during 1903. Utah also has important possibilities in the old Bingham camp, which was formerly a large producer of lead, but has not been so since the great copper deposits were opened in its mines. Lately, the operators have had their hands full in developing their copper business, but that having been accomplished, there is now talk of resuming work in the lead ore. The lead resources of the United States are certainly very great, and at present production is governed by the price which can be got for pig lead, increasing when lead is high and decreasing when it is low.

The Smelting & Refining Company's price for pig lead in 50-ton lots at New York at the beginning of 1903 was 4.10c. On March 10 it was raised to 4.35c., and on March 13 to 4.65c. On April 27 it was dropped to 4.35c., and on June 16 to 4.10c. In September the price was raised to 4.40c., and in November it was reduced again to 4.10c. About the middle of December it was raised to 4.25c. These prices are for desilverized lead. The St. Louis price for desilverized has been at the usual differential of 5@7.5c. per 100 lb. below the New York price. Ordinary Missouri pig has commanded, during 1903, a price close to that for desilverized, being seldom more than 5c. per 100 lb. lower, while chemical hard has been at a slight premium or discount, according to temporary demand.

Lead ore is sold in the United States in three ways. In southeastern Missouri it is sold on the basis of a percentage, usually 90 per cent, of its lead contents as shown by wet assay, at the St. Louis price for Missouri pig lead, less a certain returning charge, St. Louis delivery. No fault at all can be found with this method. In the Joplin district the ore is sold on direct bids of so much per ton, the bidder taking into account all the various factors of conversion into pig lead. In the Far West the ore is bought on a percentage basis, usually 90 per cent. of its lead contents by fire assay, at an arbitrary price established by the Smelting & Refining Company, less a certain returning charge. For example, the rate on Cœur d'Alene ore might be 90 per cent of the lead at 3.5c. per lb., less $18 per ton for freight and treatment.

At the beginning of 1902 the established price for lead in ore in Idaho, Colorado and Utah was 3.5c. per lb. In March, following the advances in the price for pig lead, the rate for lead in ore was raised first to 3.75c. and then to 3.90c. The Cœur d'Alene miners were given the advantage of this increase, although the output of most of them had been contracted up to September on the basis of 3.5c. With the reduction in the price of pig lead in November, the rate for lead in ore was reduced to 3.5c. The high price for lead prevailing throughout 1903 caused increased activity in all of the lead-producing districts, the silver-lead producers enjoying, moreover, the benefit of an important advance in the value of silver.

In the Cœur d'Alene there was never more prosperity. About 2,200 men were employed in the mines, the largest number in the history of the district. There were no labor troubles; the new scheme of employing the men through a central agency has been found to work well. The arrangements for the electrical transmission of power from Spokane and its distribution through the Cœur d'Alene were completed. A new strike of rich ore was made in the lower levels of the Hercules mine, which has been increasing in importance as a producer. An important feature of the year was the organization of the Federal Mining & Smelting Company, which consolidated the majority of the 14 producers of the district, including the Empire State-Idaho properties, the Tiger, Poorman and others, together with the Everett smelter. The smelter was subsequently sold to the American Smelting & Refining Company. The Hercules, the Morning and the Bunker Hill & Sullivan mines, which rank among the largest producers of the district, did not go into the consolidation.

Southeastern Missouri experienced labor troubles during the summer, which culminated in strikes at several of the mines. Save for the delays on that account, all the producers operated at full capacity, and several of them undertook measures which will lead to an increase in 1904. The most important of these developments are the construction of a 1,000-ton mill by the St. Joseph Lead Company at its Hoffman shaft, on Owl creek; an addition to the mill of the Desloge Lead Company, increasing its capacity from 600 to 1,000 tons per day; and an addition to the plant of the National Lead Company. The last has one of the finest dressing works in the United States. It is arranged in four sections, each of which was designed to mill 250 to 300 tons of ore per day, but has proved to have an actual capacity of nearly 400 tons. At present only three sections are operated. The company is now sinking a fourth shaft and installing a new breaking plant, at which the ore from all the shafts will be crushed previous to delivery to the mill. These improvements are expected to increase the mining and milling capacity to nearly 1,600 tons per day, besides reducing the cost of production. In the vicinity of Fredericktown, in Madison county, the mill of the North American Lead Company has been put in operation. The famous old Mine la Motte has been purchased by the Mine la Motte Lead & Smelting Company, an Eastern corporation, which has already inaugurated some improvements, including doubling the capacity of the old mill, the construction of a railway branch from the Iron Mountain road out to the mines, and the erection of one or two 'Joplin mills,' the last a rather doubtful experiment in this district. In the Flat River district the miners have received the benefit of railway competition through the construction of the Missouri Southern road, extending from Ste. Genevieve to Bismarck, which was completed during the autumn. This gives direct connection with the coal-field of southern Illinois, and also affords another route from the lead mines to St. Louis. The present milling capacity of the disseminated lead district is about 6,000 tons per day, which corresponds to the capacity for the production of about 57,000 tons of pig lead per annum. The additions which have been made to the milling capacity in 1903 will enable the district to put out upward of 66,000 tons of pig lead per annum.

The production of lead ore in the Joplin district in 1903 will show a considerable decrease, corresponding, more or less, to the decrease in the output of zinc ore, in connection with which it is turned out as a by-product. The local price for lead ore was extraordinarily high, being upward of $50 per ton, delivered, throughout the year, and holding steadily at $59.50 in the month of April. The high range of prices was due to competition among the local smelters, who bid against each other until there was very little margin left between the value of lead in ore and in pigs. The Joplin ore, which is entirely a concentrated product, is of high grade, containing from 75 to 80 per cent lead by wet assay, averaging in the neighborhood of 77 per cent, of which a ton yields about 1,400 lb. of lead in smelting. The local smelters used to reckon on a margin of $7 per ton to cover smelting cost and profit, but they averaged less than that in 1903. The smelting conditions in this district are so close that very little ore can be taken out of it for reduction elsewhere.

At Leadville, Colo., also, the production of lead has become closely identified with the production of zinc, both ores being produced in conjunction. The good demand for both kinds of ore in 1903 promoted activity in the district. A new separating plant was built by the Resurrection Mining Company, and the construction of one was begun by interests identified with the Yak Mining Milling Company. An important event of the year was the organization of the Western Mining Company as a subsidiary company to the Guggenheim Exploration Company, which took over the A. Y. & Minnie, the Mahala and the A. M. W. mining companies, of Leadville, and the Ute & Ulay mines, at Lake City.

While the lead miners of the United States have been enjoying a period of great prosperity, the reverse has been the case in British Columbia. Their ore, if imported for consumption in the United States, has to pay a duty of 1.5c. per pound of lead content; if imported for smelting and refining in bond, the product must be sold abroad on the basis of the London price, and the lead in ore can only be paid for accordingly. When lead is worth only £12 (2.60c. per lb.) at London, the price that the British Columbia miners receive is very unsatisfactory; they reckon that the London price should be in the neighborhood of £15 (3.25c. per lb.) to afford them a reasonable return. The London price having been far below that figure for a long time, the lead-mining business in British Columbia has withered considerably and some of the most important mines have been closed entirely, among the latter the St. Eugene, at Moyie, in the East Kootenay, which is said to be able to produce, per month, 3,000 tons of concentrates, assaying 65 per cent. In the Slocan district of West Kootenay, where the ore is of higher grade in silver, the number of mines in operation has been about as formerly, though their output of lead ore has been reduced. To help out the situation, the Dominion Government this year agreed to pay a bounty of 0.75c. per lb. (diminishing according as the London price for lead exceeds £12 10s.) on all lead produced in the country up to a total of 33,000 tons per annum, this agreement to extend for the period of five years. This is a rare gift to the miners, but they have already begun to accuse the ore carriers and smelters of designing to appropriate a portion of it. However, these matters will doubtless adjust themselves satisfactorily before long. In the meanwhile, the miners of the Slocan district are endeavoring to ameliorate their condition by developing a market for the zinc ore which occurs in connection with their lead ore, and in this they have fair prospects of success, although in zinc, as in lead, they are handicapped by their remoteness from the centers of consumption.

THE NEW YORK LEAD MARKET.

The average price of lead during the year under review is about 10 per cent higher than that of the preceding 12 months. Throughout the year all the lead-consuming industries have been very busy, and large quantities have gone into the manufacture of white lead, cables, pipes, sheets and babbitt metal.

On the other hand, production has been well under control, thus obviating the necessity of exporting lead in order to maintain values at home, as has been the case in former years.

Mining operations, as far as new camps are concerned, and increases in old ones, have been more or less discouraged, owing to the fact that the capacity of the works outside of the American Smelting & Refining Company is still rather limited. The only exception is Missouri, which State has again benefited largely, and where the production is expected to show a further increase.

The year opened with the same quotations as ruled at the close of 1902—4 to 4.05c. St. Louis, 4.05 to 4.10c. New York. Toward the end of February a very heavy demand set in, and early deliveries were difficult to obtain on account of the impossibility of getting proper shipping facilities from the railroad companies. This caused the American Smelting & Refining Company to put up its price $5 per ton on March 10, which advance was followed by another one of $6 per ton a week later.

The market remained steady for several weeks at 4.60@4.65c. New York, 4.55@4.57½ St. Louis, until the end of April, when it became evident that at the low prices ruling abroad there was danger of foreign lead being imported, notwithstanding the duty of 2⅛c. Quotations were consequently reduced to 4.27½ St. Louis, 4.35 New York, only to be followed by another drop of $5 per ton on June 17.

At the lower value established, a large business developed, and on September 15 prices were put up again to 4.40 New York, 4.32½ St. Louis. This advance, however, caused consumers to restrict business, and this, together with the proximity of the foreign markets, necessitated another mark down of $6 per ton, which took place on November 15.

Monthly Average Prices of Lead in New York.

Month.	1902.	1903.	Month.	1902.	1903.
January	4.000	4.075	July	4.075	4.075
February	4.075	4.075	August	4.075	4.075
March	4.075	4.442	September	4.075	4.243
April	4.075	4.567	October	4.075	4.375
May	4.075	4.325	November	4.075	4.218
June	4.075	4.210	December	4.075	4.162
Year				4.069	4.237

Inasmuch as stocks of refined lead were rather light and the demand improved considerably, prices were once more raised on December 14 to 4.25c. New York, 4.17½c. St. Louis, which are the closing quotations of the year.

THE LONDON LEAD MARKET.

By Our Special Correspondent.

Lead commenced the year with £10 17s. 6d. as the ruling price for soft foreign, English standing at about 2s. 6d. per ton more. Values remained steady during the first half of January, owing to the disinclination of holders to sell, but when prices had improved to about £11 7s. 6d., America came out as a seller, and prevented a further advance. Spot lead was very plentiful, and the chief demand was for distant delivery. February saw a complete change in the situation, America not only refusing to sell, but turning completely round, and buying in the London market. The trade with consumers was large, and considerable outside speculation took place, so that ultimately £12 6s. 3d. had to be paid for soft English, and March opened with a strong market at this figure, and with a renewed buying rush from consumers, there was another sharp run up to £13 15s. It was not until this figure had been reached that speculative holders were inclined to realize, this selling causing a decline to £13. Trade with consumers was very good at this time, and re-exports from America made it look doubtful if much metal would be available for export. April saw further selling by dealers, and consumers, being fairly well covered, abstained from buying, so that there was a very rapid fall, without hardly any trade until £12 5s. was reached, but at this low level buyers were tempted, and the market rallied to £12 12s. 6d.; however, on the near approach of the holidays further weakness set in, and the month closed with £12 5s. as the nearest figure. Reports from America continued satisfactory, but this did not influence prices on this side. May witnessed great apathy on behalf of consumers, so that prices gradually drifted downward in sympathy with the all-round decline in the other branches of trade. Closing prices were £11 7s. 6d. for soft foreign, being a fall of about £1 per ton on the month's trading.

June opened with very little demand, consumers during the first three weeks of the month remaining practically out of the market, so that values declined to £11 2s. 6d. for soft foreign; but just toward the end of the month cabled advices that the Broken Hill mines were likely to close down their works owing to want of water, caused a considerable amount of buying, which immediately drove the price to £12 2s. 6d. per ton; the closing price for the month was £11 15s. to £11 17s. 6d.

In July, notwithstanding the unchanged position in the Australian mines, the market declined somewhat, when consumers again withdrew, but when the level of £11 2s. 6d. had been reached, there was some fair buying on behalf of speculators, and this raised the price to about £11 12s. 6. Toward the end of July, on the announcement that the Broken Hill mines had resumed work, there was a drop to £10 17s. 6d. for spot, arrivals on the Thames of some big parcels also helping the decline.

In August, notwithstanding the very heavy arrivals of large quantities, the market gained strength, touching at one time £11 8s. 9d. per ton, but eventually declining to about £11 3s. 9d. Consumption was particularly good on the Continent, and showed signs of improving in this market. In September the market was rather more active at the opening, especially for home made, prices remaining very steady throughout the month between £11 and £11 7s. 6d.

In October, dealers, who were apparently oversold, did their best to help prices down, but the consumers being equally anxious to cover their requirements, fluctuations were only to the extent of about 5s. per ton, with a quiet market. Metal for early delivery was somewhat scarce, owing to the large shipments which were made to Russia at this time.

November again saw a very steady market throughout, with hardly any fluctuation in value. Business with consumers was all of the hand-to-mouth scale, but the supplies being somewhat short kept the tone steady.

December opened with a steady market, the consumption for early delivery being quiet, as is usual at this time of year, but with rather more inclination on the part of buyers to secure metal for next year's delivery. The market closes rather firm, Spanish lead being quoted at £11 5s., with English lead at £11 7s. 6d. per ton.

THE COEUR D'ALENE.

By Stanly A. Easton.

The silver-lead mines of the Cœur d'Alene, Shoshone county, in northern Idaho, show an estimated production for the year 1903 of 102,617 short tons of lead and 5,500,000 oz. of silver. This is an increase over past years, and the outlook indicates an equal or even greater production in the immediate future.

From a turbulent and lawless country, with correspondingly intermittent operations, the Cœur d'Alene has now become one of the most prosperous and attractive mining fields in the West, giving steady employment to 2,000 men in the district itself, and not less than 1,000 additional at the smelter plants treating the product, and in the allied industries. This condition has been brought about by the steady and consistent efforts of the mine operators, and of the better portion of the community, to eliminate the disorderly and lawless bodies of individuals, wedded to anarchy and socialism, who made the Cœur d'Alene, in the past, synonymous with disorder, violence and crime.

Among the events of interest during the year are the taking over of the Standard and Mammoth mines, on Cañon creek, and the Empire-State properties at Wardner and Burke by the Federal Mining & Smelting Company, formed for that purpose. The details of this consolidation have been already published in this Journal. It is expected that the consolidation of management and its resulting economies, with possibly a closer relationship between the producers and the smelting interests, will prove beneficial.

The completion during the year of the power-transmission line from Spokane Falls to Burke has furnished a power cheaper than steam and free from the uncertainties of coal production and transportation. The line has a total length of 101 miles, and at present is transmitting 1,400 h. p. It is a three-phase system, and operates at 45,000 volts. It is so arranged that it may be operated at 60,000 volts, with a corresponding increase of power transmitted.

As to the mines, the development of the Hercules, above Burke, is of special note, as it has given to the district additional productive territory and a virgin property of great promise. The mine, now developed to a depth of over 1,000 ft., has paid for its own development and equipment, and is operated without concentration, the ore being of such grade that shipping direct in a crude state is possible, with a large margin of profit.

The general parallelism of the veins or fracture system is a noteworthy feature of the district, as is also the apposition of the ore-bodies on different veins, a fact which should serve as a guide in future explorations. The country rock is uniformly quartzite, and is remarkably free from igneous intrusions, there being merely a few bosses of granite or syenite, and a few small dikes of recent basalt. In many places cleavage has been developed in the quartzite, and the bedding is almost destroyed. Local secondary silicification often occurs, particularly adjacent to ore-bodies, making an 'ore-bearing' quartzite easily recognized by the experienced underground man. Ripple and rain-drop marks have been readily recognized. The ore consists of crystallized and amorphous galena, in a quartzite gangue, with iron carbonate, a little blende, pyrite, marcasite, chalcopyrite, and occasionally gray copper. It is found within, or adjacent to, fractures in the quartzite, some being simple fractures, some fault-planes and some sheeting. The ore-shoots are large, the Morning mine, at Mullan, having a shoot approximately 1,500 ft. long, with a width of 8 ft. of stoping ground, and at the Bunker Hill & Sullivan mine, at Wardner, ore-bodies are worked 400 ft. long, with an average width of 30 ft. The ore always contains silver, but no gold. The silver content varies from a ratio of one-third of an ounce to 1 per cent in lead up to several hundred ounces per ton in the oxidized surface ores and those containing gray copper; nevertheless, in individual ore-bodies the proportion of silver remains quite constant throughout. Ore opened up at a depth of 2,000 ft. below the surface in the Bunker Hill & Sullivan mines, at Wardner, shows no general change in character or grade, and is really more free from foreign sulphides than that from the upper workings.

THE SOUTHEASTERN MISSOURI LEAD DISTRICT IN 1903.

By Our Special Correspondent.

The output of southeast Missouri in 1903, of which the December product is estimated, approximates 65,000 tons (of 2,000 lbs.) of lead, valued at $5,200,000, with by-products of nickel and cobalt that approximate $50,000, and dry-bone or zinc carbonate estimated at 2,000 tons and valued at $26,000. Of this output, St. Francis county produced about 60,000 tons lead, or 87 per cent, from seven disseminated properties; Madison county produced about 5,500 tons lead, or 8 per cent, as also the $50,000 nickel and cobalt, from three desseminated properties; Washington county, from innumerable shallow diggings, scattered over four large estates, furnished about 1,500 tons lead, or 2 per cent; Jefferson county,

from similar shallow diggings, produced about 550 tons lead, or less than 1 per cent, and about 2,000 tons zinc carbonate; and Franklin county, from several small mines operating on fissure-veins, produced about 1,000 tons lead, or slightly over 1 per cent.

The year 1903 has been a prosperous one in this district, and the output passes the previous high record of 1902. This increase in the production is mainly due to the growth and development of the older properties, although one new company made a modest entry among the ranks of the producers.

In spite of wages being increased 20 to 30 per cent in 1903, the old dividend-paying properties maintained their usual, regular dividends, as the lead market remained at a very satisfactory level, or from 4 to 4.25c. per pound at St. Louis.

Labor has been scarce and very unsatisfactory, and several strikes occurred, but they were not protracted, and no violence was reported. The labor unions secured a firm foothold throughout the district in 1903, which is the first time they have become a local power. The entrance of the labor unions has discouraged all new enterprises and prospecting, and the lead companies are likely to soon make a combined effort to throw off this yoke.

The important event of 1903 was the opening of the new Missouri Southern Railroad, which enters the heart of the growing Flat River district from the southern Illinois coal-fields. It is a well-built, standard-gauge road, with light grades and easy curves, that is probably a preliminary link in a trunk line that is likely to reach from Cincinnati to Kansas City. This new road not only introduces competition into this field, but it is a short, direct route to the choicest portion of the Illinois coal-fields.

The four new companies that are in a preliminary stage of development, or the Union, Penicaut, Elizabeth and Manhattan, have done little this year, and are awaiting more favorable labor conditions.

The Irondale Company, which closed down in 1902, is still idle and its mine full of water, and is the only unsuccessful developed property in the disseminated belt.

Of the active disseminated companies, the St. Joe Company, the pioneer in working the low-grade disseminated ores in 1869, made the banner record of its history, as it produced about 20,000 tons of lead. Many improvements have been made in the plant in 1903, by enlarging the roasting plant at Herculaneum and equipping it with self-dumping trestles; in replacing haulage underground with mules by compressed-air locomotives, which also enabled the closing down of shafts Nos. 3, 4, 5 and 6 by concentrating their output on No. 1 shaft; and the capacity of the mill has been materially increased through a greatly improved system of crushing that has effected a marked economy in labor and power. A large new mill is under construction at the Hoffman or No. 12 shaft that will be a great improvement over the present mill, which was erected 20 years ago. The Hoffman shaft is being put in efficient condition to supply the new mill, which by July 1 should increase the output of this successful company at least 50 per cent.

The Doe Run Lead Company is quietly but regularly outputting about 12,000 tons lead per annum, from its Nos. 2, 3 and 4 shafts. No. 6 shaft has not yet been equipped, though timbered to the ore-body. The pumping problem has materially improved at this property, as there is now much less water to handle than formerly, from the apparent slow exhaustion of the water basin.

The Desloge Lead Company has completed and equipped its new No. 4 shaft, which promises to become a large producer. The mill is now being enlarged to handle an increase of 50 per cent, and other improvements are being made. The output was about 6,500 tons lead in 1903.

The Central Lead Company continues its very successful career, and produced about 6,500 tons in 1903, in spite of being tied up with a strike for nearly a month. Material improvements were made in the mill, and connections have been made with the new Missouri Southern Railroad.

The National Lead Company completed its new No. 4 shaft in 1903, that should materially increase its output in 1904. About 10,000 tons of lead were produced in 1903, and as this was smelted at custom smelters, it is now proposed to erect its own smelter in East St. Louis.

The Federal Lead Company has suffered considerably from shortage of labor in 1903, and local railroad litigation temporarily shut them off from the Derby shaft. This has reduced the output to about 3,000 tons lead, and a recent reduction in their force will still further curtail it in 1904.

The Columbia Lead Company leased its property to the Commercial Lead Company in 1903, and the latter has some large projects under way that are likely to greatly increase their output in 1904. Pending changes in the management and delays from strikes, the output in 1903 was only about 2,000 tons lead.

The Catherine Lead Company at Fredericktown produced about 2,000 tons lead in 1903, and the new Buckeye or North American Lead Company, in the same district, started up its 200-ton mill in 1903, and produced about 1,500 tons lead.

The Mine la Motte property, under its new Eastern management, has enlarged its milling and mining facilities, and produced about 2,000 tons lead in 1903, and about $50,000 in nickel and cobalt. From this modest output it has already declared a quarterly dividend of 2 per cent on its $3,000,000 capital, and it is stated that this rate will be continued. The source from which such generous dividends are paid seems well worthy of investigation by its stockholders.

If the improvements and enlargements now under construction are completed on time, and there is no interference from strikes, the output of this district in 1904 should approximate 75,000 tons, or about 10,000 tons greater than 1903, and this increase will be derived from the older disseminated mines.

THE SUDBURY NICKEL MINES.

By A. McCHARLES.

Contrary to expectations, there was not as much work done in the Sudbury nickel mines during the season of 1903 as in each of the previous three or four years, but for three unusual reasons. A local scarcity of labor compelled the International Nickel Company to shut down all its mines for the summer months, and use most of the men in the construction of the new smelting plant. The result has proved very satisfactory in every way, as the company had sufficient ore mined ahead and on the roast-heaps to keep the old furnaces and the concentrating plant going the whole time. In fact, the production of matte for October and November was the largest monthly output in the history of the company from the start.

Ground was broken for the new plant on April 20 last, on a very rough and rocky hillside behind the Copper Cliff mine, and a great deal of blasting and excavating had to be done for the foundation walls. But by next spring, or within one year from the commencement of the work, the plant will be completed and ready to blow in, with two large furnaces, having a daily capacity of 500 tons each. There will be no change in the method of treating the ore, except that the ordinary matte from the smelting furnaces will be bessemerized into matte carrying 80 per cent in combined nickel and copper, precisely as at the works of the Mond Nickel Company, down the line. Large storage bins are also being built in connection with the new plant, so as to have a reserve stock of ore of about 20,000 tons at hand, to prevent any delays from changes of weather, railway accidents or other mishaps. These smelting works will be the first in the district to be almost entirely operated by electrical power, generated in a central steam plant. The buildings are all of brick and steel, and the equipment throughout will be of the most convenient and improved character that could be made. For the more economic handling of the ore and other materials used at the furnaces, the company has built a number of 50-ton drop-bottom dump cars, and purchased two new 80-ton locomotives, one of which is largely made of nickel steel. Mr. A. P. Turner is general manager of all the company's works and mines in the Sudbury district, and the head office is at Copper Cliff.

Work was suspended in the spring by the Mond Nickel Company on the Victoria mine, which is a very large and valuable ore-body, and fully opened up to the 700-ft. level and ready to stope out. The only ore raised by this company during the rest of the season was about 100 tons a day from the North Star mine. But that mine also, as well as the smelting works of this company, was closed down at the end of November last, for the simple reason that more matte had been made than the Mond nickel refinery at Clydach, Wales, could treat. But the capacity of the refinery is being doubled now, and operations at the company's mines and works will likely be resumed on the old scale in the spring.

The Lake Superior Power Company, that was to have revolutionized the nickel industry of northern Ontario by supplying the whole world with ferronickel and utilizing the sulphur and other by-products in the ore, has not succeeded in accomplishing either, and the nickel mines and smelting plant of this company were shut down tight some months ago. But it is hoped that the company, which really owns several good nickel properties, will get over what is locally known as the "financial cramps" in some way, and begin to work again under more practical and economic management than in the past.

A syndicate of American capitalists, with headquarters in Milwaukee, Wis., bonded the Mackenzie mine, in the township of Levack, last summer, and did considerable stripping and other surface work before the winter set in, which was earlier than usual last year. Since then a diamond drill has been employed on the property in testing the extent and character of the ore-deposit to some depth.

Hidden mines are hard to find, and especially in the Sudbury district, with its overburden of clay, sand and muck on the low, swampy lands. But Thos. A. Edison has had a party, composed mainly of young college students, trying to locate and find such mines, with the dip needle, in different parts of the nickel belt for the past three seasons; and he also began last year to exploit two of the claims with a diamond drill, but with what result, if any, has not been made known yet. To show how thoroughly the old prospectors, few in number, and with only a very poor knowledge of the surface indications of a nickel mine, did their work, it is enough to state that not a single discovery of any value has been made on the whole nickel belt for many years past.

A nickel refinery in the Sudbury district, in the near future, will probably be one of the minor results of Chamberlain's imperial policy. Canada wants it.

NICKEL IN INDO-CHINA.—A recent report from Tonkin, French Indo-China, states that a deposit of nickel-copper ore has been found near Tuyen-Quang. The ore is a mixture of oxides and hydrates of manganese, iron, cobalt and nickel, and is said to assay as high as 8 per cent cobalt and 4 per cent nickel.

COAL IN MANCHURIA.—A correspondent, writing to the London *Times* on the coal-fields of Manchuria, states that the Russian Government has reserved to itself the right of exploring the rich coal-fields discovered in the valley of Souchan, in Manchuria. The plan of exploitation was fixed in 1900 by a special commission. A railway was to put the mines in communication with the bay of Nakhodka. The initial expenses have been estimated at 2,400,000 rubles for the opening of the mine, and the annual working expenses, calculated on an output of at least 6,000,000 poods per annum, at about 500,000 rubles per annum. The entire initial capital is to be written off from coal revenues in 16 years.

ZINC IN 1903.

BY W. R. INGALLS.

The zinc business in the United States in 1903 was about as profitable as in 1902, high prices having prevailed throughout the year. A decline set in about the beginning of November, but, although it was rapid, the price did not fall below what would normally be considered a high level, and about the middle of December the market began to trend upward again. The high range of prices in 1903 has been due to a strong demand for consumption, and this has kept the smelters busy, although the increase in smelting capacity has been considerable. There were some labor troubles at Iola early in the summer, and later on there was a scarcity of furnacemen, which caused a comparatively few furnaces to be put on dead fire. Otherwise the full number of furnaces has been in steady operation, save those which have had to be put out of commission for the usual periodical repairs. The works of the Lanyon Brothers' Spelter Company, at Neodesha, Kan. (a four-block plant), which was built in 1902, came into full operation in 1903. Early in the latter year it was purchased by the Granby Mining & Smelting Company. The new plants of 1903 have been those of the United States Zinc Company (affiliated with the American Smelting & Refining Company), at Pueblo, Colo.; the Laharpe Smelting Company, at Laharpe, Kan., and the Chanute Zinc Company (Hess & Stuecke), at Chanute, Kan. The Pueblo works has six furnaces, each of 240 large retorts, of which the first was fired up in June. The Laharpe Smelting Company plans to have three blocks, with approximately 1,800 retorts; the first was put in operation about October 1, the second shortly after November 1, while the third will be completed near the end of the year. The works of the Chanute Zinc Company, a two-block plant, will also be in operation toward the end of the year. The Cherokee-Lanyon Spelter Company built a new block at Gas in February, and the United Zinc & Chemical Company, at Iola, completed a new block in November. This gives a large increase in the smelting capacity over and above what there was at the beginning of the year, but now that the smelters are treating a good deal of Colorado ore it takes more furnaces to produce a given quantity of spelter than from the richer Joplin ore.

There is prospect of a further large increase in 1904. William Lanyon is understood to be contemplating the erection of a four-block plant at Caney, and A. B. Cockerill a three-block plant at Altoona. The Grasselli Chemical Company is building a plant in the East. Besides these, one or two other plants are projected. It has been rumored from time to time that an increase is to be made in the capacity of the Cherryvale plant of the Edgar Zinc Company, but the last would not appear to be very likely at the present time.

Of the Western smelters who use coal as fuel, there were in operation in 1903 the large plants at Lasalle and Peru, Ill., and the small plants at Waukegan, Wenona and Sandoval, Ill.; Rich Hill, Mo., and Girard, Kan. The Carondelet plant of the Edgar Zinc Company, at South St. Louis, was operated as usual. The Collinsville Zinc Company, at Collinsville, Ill., resumed smelting, but after a few months gave it up. Outside of the Lasalle-Peru and Carondelet plants, the aggregate output of this group of works was small, the competition of the gas smelters permitting them to run only under exceptional conditions. In Indiana some smelting was done at Marion and Upland, but owing to the nearly exhausted condition of the gas supply, the zinc-smelting industry in that field is almost ended.

The average price of spelter at New York in January was 4.865c. It rose almost without interruption until August, in which month the average was 5.725c. There was a slight recession in September, which tendency became more pronounced in October, and toward the end of the latter month there was marked weakness, which continued through November, the price dropping to 4.65c. New York, 4.50c. St. Louis at the end of the month. Toward the end of December there was a recovery to 4.875, New York. The value of sheet zinc fluctuated approximately with the price of spelter, opening at a basis of 6.65c., f. o. b. mills, advancing to 7.15c. in March, touching 8c. in May, and falling to 5.75c. at the end of November. The last price afforded a margin of only 1c. per lb. over the price of spelter, which is less than usual. In the London market spelter ranged from £20 (4.34c.) to £24 (5.21c.). There were periods when the difference in price was nearly sufficient to permit imports, while at the end of the year the conditions had changed so that the export point came in sight. At certain periods there was difficulty in securing prompt railway transportation from the West, which caused wide differences to exist temporarily between the prices of metal on the spot in New York and orders for shipment from the works. At the beginning of the year there was a small stock of spelter at St. Louis, estimated at 3,000 to 5,000 tons. Before mid-year this had been exhausted, the markets were everywhere almost bare of stocks, and the smelters had sold up far ahead. The slackening of demand in the last quarter of the year caused some stocks to accumulate again.

In the Joplin market there was a small stock of ore on hand at the beginning of the year, and in order to bolster up the price, an exportation of 1,000 tons was made in January, which, as it turned out, was a mistake. Unless the London price for spelter be materially in excess of the New York price, exports can only be made at a loss, and, anyway, it would be better to export spelter than ore. The actual cost of shipping this 1,000 tons of ore from Joplin to Antwerp, including difference in assays, shrinkage, etc., was $8.30 per ton.

The basis price for ore assaying 60 per cent Zn at Joplin was $31@$32 in January and $32@$33 in February. In March there was a rise from $33 to $37, and $38 was attained in April. In May the price declined to $36, and in June it ranged from $36 to $37. From the end of June until the middle of September it was steady at about $36, then falling to $35. In October the market was weaker, because of the declining tendency of the price for spelter, and ore sold at $35@$34. After the first week of November the market became demoralized and the price fell to $30. In order to support the market, the miners determined on the policy of operating their mills on part time, or closing down entirely, so as to restrict the output. A partial shut-down was brought about and remained in effect several weeks, but it failed completely in its purpose of influencing prices, did not even inconvenience the smelters, and had the only results of reducing the stock of ore somewhat and starting an exodus of miners who were thrown out of work. In alarm at the last effect, the shut-down was called off in the second week of December, and such an attempt to control the market will probably not soon be tried again. The output of the district is made by a host of small producers, and because of their large number and the necessity of many of them to keep going, so long as it can be done at any profit at all, concerted action is difficult to bring about. In 1902 there were 278 mills and 241 hand-jig plants in southwest Missouri alone, and an additional number over in Kansas.

An important feature in the zinc business in 1903 was the shortage in the supply of ore from the Joplin district, the output of which will show a falling off as compared with 1902. In the first quarter the shipments amounted to 58,381 tons, an average of 4,491 tons per week. In the second quarter they were 63,964 tons, an average of 4,920 tons per week. In the third quarter they were 63,076 tons, an average of 4,852 tons per week. The weekly average during the fourth quarter will not be more than 4,000 tons. In the first six months of 1902 the total ore shipped was 122,345 tons, against 125,500 tons in the last half and 137,000 tons in the first half of 1902. The total for 1903 will probably be about 235,000 tons.

The decline in production in the Joplin district was due partly to the very wet weather in the spring, which interfered with operations to some extent, but the chief cause is obviously the inability of the mines of the district to do any more than they have been doing. It appears that the productive capacity of the Joplin district has attained its maximum, even if it be not already on the wane; the discovery of new mines has not kept pace with the exhaustion of the old ones. In 1898 the output jumped to 235,000 tons, rising further to 256,500 in 1899, and falling off to 242,500 in 1900. In 1901 it rose to 258,000, and in 1902 attained a maximum of 262,500, which, however, is but little more than 10 per cent gain over 1898. During all these years the price of ore has ruled high. In 1898 the average was $28.44; in 1899 it was $38.54; in 1900 it was $26.50; in 1901 it was $24.21; in 1902 it was $30.70, and in 1903 it will be in the neighborhood of $34. Previous to 1898, prices averaged much lower than during the last six years. It is evident, therefore, that the recent high level of prices has failed to stimulate the output of the district materially. The maintenance of the output has been due to the mining and milling of a lower grade of ore than could formerly be handled profitably, rather than to the discovery of new mines. This would indicate the necessity for a continuance of high prices, unless some new zinc-mining districts of importance be quickly developed. Naturally, attention has been keenly directed toward other fields during 1903.

The most promising of the new fields appears to be southwestern Wisconsin, which is not really a new field at all, inasmuch as, historically, it antedates Joplin. Some ambitious ventures have been undertaken there in the past, but they have been baulked by various circumstances, among others by the difficult character of the general run of the ore; and mining has been conducted chiefly in a very primitive way, resulting in an output of about 15,000 tons of ore per annum, without much change from year to year. All this promises soon to be changed, since mining men from the outside, including a number from Joplin, have begun to investigate the field; and their opinion appears to be generally favorable. There seems to be no doubt that the Wisconsin mines have important resources of ore, from which a considerably increased output can be made by the introduction of improved methods of mining and milling. In fact, they have made an increased output in 1903. In 1902 and 1903, 20 concentrating mills of the Joplin type have been built in the district, most of which are now in operation.

The Wisconsin ore is not so good as the Joplin ore, not even when thoroughly cleaned, but it is nevertheless a high-grade ore. The associated minerals, especially the marcasite, make it rather difficult to separate clean blende, but this difficulty promises to be largely overcome by the application of improved methods of electrical separation. Some such plants have already been installed.

The commercial effect of an increased ore output from Wisconsin will be chiefly in favor of the Illinois smelters. The market for spelter is chiefly in the East, and consequently Wisconsin ore could hardly be carried profitably to Kansas for smelting. An additional supply of ore for the Illinois smelters, who have heretofore drawn heavily from Joplin, will tend, however, to leave the latter market more open to the Kansas smelters, who are also well situated with respect to the Colorado market. In 1903 the Kansas smelters treated a good deal of ore from the Rocky Mountains, three of them having been rather large buyers. At one time, two plants at Iola were running exclusively on ore from the Far West, one of them being the Cherokee-Lanyon Spelter Company. The latter concern later on returned to the Joplin market, but after a short while reverted to its former practice of smelting Colorado ore alone.

The development of a market, both abroad and at home, for such zinc ore as can be produced in the Rocky Mountains has created great interest in the exploitation of those resources. Leadville, Colo., has continued to be the principal point of production, but shipments have been made from Kokomo, Creede

and Rico, in Colorado; from Park City and Frisco, Utah; from the Magdalena district, in New Mexico, and from the Slocan, British Columbia. The supply of this kind of ore is very large, indeed, and, for the present at least, the output is limited only by the milling facilities and the capacity of the markets. Although the value of the ore is comparatively low, because of its inferior character and the high freights that must be paid on it, the fact that it is commonly produced as a by-product in conjunction with silver-lead ore, enables the miner to realize a satisfactory profit. At present this kind of ore is shipped to the spelter producers of Belgium, Kansas and Colorado to the United States Reduction & Refining Company, which manufactures zinc-lead white at Cañon City, Colo., and to the Ozark Zinc Oxide Company, of Joplin, Mo., and the Mineral Point Zinc Company, of Mineral Point, Wis., both of which concerns make zinc-white. The works at Cañon City were destroyed by fire in 1903, but have been rebuilt, with increased capacity.

Further east there has been considerable activity in zinc mining in Arkansas, Kentucky and Tennessee, all of which States have made small outputs. The result of the year in Arkansas has been rather disappointing. The existence of zinc ore at numerous points in the northern portion of that State has been known for a long time; one or two of the mines produced ore as far back as 10 years ago. It has always been claimed that a considerable output could be made as soon as railways entered the region. Now, both the Frisco and the Missouri Pacific have built in, the White River branch of the latter having been opened in 1903, but the ore shipments have not yet attained a noteworthy figure. It is true that the railways have not gone directly to the mines, but they will not do that until a mining center which will warrant the construction be developed, and in the meanwhile the ore must stand a wagon-haul. Northern Arkansas is topographically rather rough, and the carting of the ore is more or less expensive, but if the ore cannot stand a $3 or $4 haul when the basing price is $35, Joplin, the outlook for mining on a $25@$30 base is not promising. However, several mills have been built in Arkansas in 1903, and the prospect is for an increased production from the district in 1904, if the price of spelter be maintained at a high level. In Kentucky developments have been prosecuted more actively in the mines near Marion, from which increased shipments have been made, and the limits of the district have been extended. This district is to have improved railway communication with St. Louis.

Tennessee has failed to show any improved prospects. More or less work has been done in the district extending easterly from Knoxville, and a 'Joplin' mill was erected at the Roseberry mine, but it is said the results were unsuccessful. The ore which is found in that locality is of extremely low grade, and even if it be improved by an expensive hand sorting, the production of a clean blende is very difficult, because of the association of barite.

In the East, the New Jersey Zinc Company has completed the improvements at its Palmerton plant, with the exception of the blast furnace, which will be ready early in 1904. The company contemplates the addition of 120 furnaces to its oxide plant.

In the metallurgical treatment of zinc ores attention has been directed chiefly to the preparation of a better product for the smelter from the base, mixed ores which exist so abundantly. The magnetic separators have accomplished a good deal in this direction, especially the Wetherill. The patents covering the latter being so well sustained, and the royalties derived from them being so large, efforts have been made, naturally, to develop other types, some of which have come into practical use, among them the Cleveland-Knowles, used in Wisconsin and elsewhere; the Mechernich, which is employed in Europe and at Broken Hill, and the Ulrich, also employed at Broken Hill. Experiments of a promising character have been made at Denver, Colo., and in Wisconsin, with the Blake separator, which works on the principle of electrostatic repulsion, an idea not heretofore developed.

Notwithstanding the degree of mechanical and magnetic perfection arrived at in various of these separators, there remain many ores from which a satisfactory product is still unattainable; for example, the ores of Broken Hill. This has led to further experiments on the treatment of the latter and the recent development of a new kind of separating process, which is due to Mr. G. D. Delprat, general manager of the Broken Hill Proprietary Company. In this process the ore, finely pulverized, is fed into a bath of acid water, the specific gravity of which is increased by the addition of a suitable soluble salt, such as sodium nitrate or salt cake. The acid in attacking the blende produces bubbles of gas, which, adhering to a particle of ore, cause the latter to float to the surface, whence they may be skimmed, or otherwise removed, while the gangue and minerals unattacked by the acid settle to the bottom of the vessel, whence they may be drawn off by any suitable device.

In the smelting of ores there has been no very important improvement. New forms of furnaces have been experimented with in the effort to obtain a more equable temperature and an easier manœuver. In the United States the natural gas smelting interest is predominant. Iola remains the chief center, and although new concerns manifest a tendency to locate elsewhere, because of the pre-emption of the best gas territory in the Iola pool, they stick to the Iola type of furnace. The latter is undergoing some changes; although the type is well settled upon, minor modifications are made according to individual ideas. Some smelters have increased the length of the furnace to 18 sections, giving 720 retorts per block, while others have reduced the length by constructing 'split furnaces,' which are an ordinary block cut transversely into two, both in one house, but each with its own pair of chimneys, so that it is practically an independent furnace. There has been manifest lately a tendency to cut down the height of the furnaces from five rows to four rows, a modification which is much liked by the men, since the four-row furnace is considerably easier to charge. In the minor details of the pipe fitting, and the arrangement of the ports for the introduction of the air and gas, almost every smelter has his own ideas, and no two will have precisely the same method, although the general system is the same. At one plant experiments have been made with an entirely new type of furnace.

The Cherokee-Lanyon Spelter Company has continued the use of the Sadtler retorts, but siloxicon has been substituted for chromite as the lining material. The same substance has been used in Europe for the same purpose.

The roasting furnace litigation remains still unsettled. The owners of the Brown patents won their case with the Lanyon Zinc Company over the Ropp furnace, whereupon the Lanyon Company reconstructed its Ropp furnaces according to the Cappeau design. The plaintiffs then brought a new suit, claiming that the Cappeau furnace is also an infringement, and on December 5 got a decision in their favor and a permanent injunction against the Cappeau furnace, the Lanyon Company having, however, the right to take the case up to the Circuit Court of Appeals, pending which the injunction has been stayed. It is expected that the appeal will be heard at St. Louis January 12. A Davis furnace has been installed at the Granby works at Neodesha. It was put in operation in November, and except for certain difficulties that can be remedied is said to be giving satisfactory results. All of the other new plants erected in Kansas in 1903 have been provided with hand roasters of the ordinary type.

The production of spelter in the United States in 1903 shows a small decrease. The figures for the year are based upon returns received from the smelters, the December output being estimated. They compare with the complete statement for 1902 as below, the quantities being in short tons, of 2,000 pounds:

	1902.	1903.	Changes.
Missouri and Kansas	97,869	96,672	D. 1,197
Illinois and Indiana	49,672	48,998	D. 674
South and East	10,696	10,648	D. 48
Totals	158,237	156,318	D. 1,919

The total decrease was 1.2 per cent. The output for 1903, however, exceeded that of any year prior to 1902. Comparing it with 1901, there was an increase of 15,496 tons, or 11 per cent, in the total.

THE NEW YORK SPELTER MARKET.

The year under review was again a fairly prosperous one for the zinc industry of the United States. In spite of an increased production, home consumers were again able to absorb practically all the metal available, brass mills, galvanizers, as well as sheet zinc manufacturers, being very busy the greater part of the time.

Fair quantities have been used for electrical purposes and the paint and oxide business is also said to have been satisfactory.

It was not until the end of the year that some stocks began to accumulate, owing to a falling off in orders, caused principally by the depression prevailing in the iron trade. However, the proximity of the foreign and domestic markets prevented prices from going to pieces entirely.

Continuous activity was the feature of the industry in the Iola gas belt, most of the smelters running full throughout the year. In Colorado the new plant at Pueblo has been started and correspondingly larger quantities of Colorado ores which formerly went to Europe are now being treated in this country.

The year opened with spelter quoted at 4.37½ to 4.40 St. Louis and 4.55 to 4.57½ New York. These low prices soon attracted the attention of consumers and the market advanced steadily from month to month, sharing in the general prosperity in evidence in the metal industries during the first half of the year.

Spot metal commanded a premium at nearly all times, the trade suffering from freight congestion and inadequate transportation facilities during the lake and rail season. The floods in the West also seriously interfered with shipments.

Throughout the summer, values were well maintained at about 5.50 to 5.60 St. Louis and 5.70 to 5.80 New York, in spite of a falling off in the consumption caused by the various building strikes.

In October, however, prices began to give way; the demand became rather slack and the few orders which presented themselves were eagerly competed for. From 5.15 St. Louis and 5.35 New York, which were the ruling quotations during the first half of November, the market declined to 4.50, St. Louis, and 4.67½, New York, by the middle of December. The proximity of the domestic and foreign markets, the latter showing considerable strength, checked a further decline, and a rather active business developed, which carried the price to 4.70 to 4.75 St. Louis and 4.87½ to 4.90 New York.

Monthly Average Prices of Spelter.

Month.	New York, 1902.	New York, 1903.	St. Louis, 1903.
January	4.27	4.865	4.689
February	4.15	5.043	4.681
March	4.28	5.349	5.174
April	4.37	5.550	5.375
May	4.47	5.639	5.469
June	4.96	5.697	5.537
July	5.27	5.662	5.507
August	5.44	5.725	5.550
September	5.49	5.686	5.514
October	5.38	5.510	5.350
November	5.18	5.338	4.886
December	4.78	4.731	4.556
Year	4.84	5.400	5.191

THE LONDON SPELTER MARKET.

BY OUR SPECIAL CORRESPONDENT.

The year opened with an excellent consumptive demand for spelter, for galvanized iron and yellow metal, which manufacturers covered freely at the current rates of £19 15s. for ordinaries and £19 17s. 6d. to £20 for specials. Continental producers sold good quantities at gradually advancing prices, so that before the month was out the price of ordinaries had risen to £20 5s., specials being held for £20 10s.

In February America sent over strong reports as to the market on that side, and, the consumption in Europe being on a very large scale, there was a revival of the upward movement, ordinaries rising to £21 12s. 6d., and specials to £21 17s. 6d. Dealers being well sold found difficulty in replacing their stock, while the continued big demand from all sources absorbed all that was available.

Business in March was on a still larger scale, and with considerable excitement values were forced up to £24 for ordinaries, specials realizing about 2s. 6d. per ton more. The demand from all sides continued exceedingly active, prices in America also advancing to a high level, the English parity being about £26 15s. Toward the end of the month the generally unsettled state of all markets, both trade and financial, caused a slight setback, the close being at about £23 2s. 6d. for ordinaries.

Early in April producers, who were fully sold, showed no signs of meeting the market, but second-hand lots held by Continental dealers were put on the market, and this, with a fair amount of bear selling, caused a drop on forward metal to £22 2s. 6d., but on the renewal of buying on the part of consumers there was a quick upward move again to £22 17s. 6d. for ordinaries and £23 for specials. At the end of the month consumers showed but little interest, whilst second-hand lots continued to be offered cheaply, so that at the end of the month the price of ordinaries was reduced to £21 10s.

In May, trade remained very quiet, inquiry falling off to a marked extent, causing an eventual decline to £20 5s. for ordinaries and £20 10s. for specials.

The first week in June witnessed a large demand on behalf of galvanizers, who made free purchases, so that values were quickly driven up to £21, but the cessation of this demand and very free selling by holders drove prices down again to about £19 15s. for ordinaries and £20 for specials.

July commenced with a somewhat better feeling, and a few buying orders sufficed to raise values to £20 15s., but Continental producers showing more inclination to sell, and realizations of speculative parcels caused a drop to £20.

August opened quietly, but later on a good trade was possible owing to a better business in galvanized iron and yellow metal, and with producers holding for very high prices values quickly recovered to £21. Toward the end of the month the demand was very big, and full prices had to be paid for anything in the way of early delivery.

In September the rising market was checked by a fair amount of selling by Continental holders, but when this had ceased the unsatisfied demand was large enough to help prices up again to £21 for ordinaries and £21 5s. for specials. Later in the month values fell away, owing to inactivity on the part of buyers, and bad trade in sheet zinc.

Free selling by dealers caused the price in the early part of October to sag away to £20 2s. 6d. for ordinaries, but on an improved demand, chiefly from galvanized iron makers, there was a good recovery to £21, a large business being done during the rise.

November found most consumers rather bare of material, as they had been purchasing only on a hand-to-mouth basis, but Continental dealers were free sellers, and showed some anxiety to get rid of their stocks, so that a fall took place to about £20 10s. for ordinaries and £20 12s. 6d. for specials. Most of the producers seemed quite willing to shade prices, and a fair business was put through at the lower level. During December the market developed considerable strength, and full prices were being paid, especially for near delivery. The closing quotations are £21 10s. for good ordinaries, £21 15s. for specials.

THE JOPLIN DISTRICT IN 1903.

BY OUR SPECIAL CORRESPONDENT.

Mining.—During the year 1903 there have been no radical changes in the general plan of mining operations in the district, yet each year notes some improved metallurgical methods for increasing the saving of the blende from the ore, or of reducing the cost of production. The changes the past year have been directed toward the saving of slimes and the adoption of the bin or hopper feed for the concentrating mills. The former has increased the output of some mines, and the latter has lessened the cost of outputting a given tonnage of ore.

The year's output is lower than that of 1902, but the prices have been higher; this, with more economical management, has increased the earning power of mines, though their outputting capacity may have been decreased.

The smaller output of 1903 is attributable mainly to the refusal of a majority of the operators to run night shifts at their mills. Another factor is that during 1901 ore prices were low, and there was little prospecting done until the latter part of that year. The depth at which uniform deposits of ore are encountered require approximately two years for development work after a prospect has been located by drill. Few prospects were found in 1901, but a number were found during 1902 and 1903. These should have the effect of enlarging the output for 1904, considering the probability of an active spelter market. Especially during the past year has the prospecting by drill of lower levels been prosecuted. None of these lower levels have been developed, and it is quite probable that very few, if any, of them will be outputting this year.

The feature that gives to the Joplin district its greatest measure of success is the accessibility to transportation, and its nearness to the gas and coal-fields where the zinc ore is treated. The general topography of the country admits of the laying of railroad switches to the mines at a low cost, and a majority can unload fuel from the cars direct into the coal bins of their concentrating mills. As all the concentrates must be shipped away for smelting, a low expense is entailed in loading the ore. Competing lines of railway—four in number—afford a low rate for ore shipments. Considering the high average metallic contents of the concentrates and the easy milling of the ore, together with the facilities of obtaining fuel and supplies and sending the ore to the smelter, the Joplin district is far in the lead of all other present zinc producing areas for immediate results.

During the past year very few new mills have been erected, but a large number of those constructed during the boom years over holes in the ground, that never were mines, have been removed to mines that are producing steadily. Hindrances to mining during the year, causing only a small loss of time, but adding expense and inconvenience to the industry, are summed up in a fuel shortage, excessive rains, unusually heavy water, and the scarcity of mine-powder following the spring floods. Few mines were actually shut down, but a greater expense was necessary to output the ore.

Drill prospecting has been more extensive, more comprehensive and more intelligently performed the past year than ever before, accomplishing greater results. From a few of the drill prospects of the year, where shallow mineral in free-ore deposits was encountered, mines have been made, increasing the output toward the latter part of the summer. The greater number of prospects located by drill during the year are yet in early stages of development. At Aurora, zinc ore was encountered by drill at from 278 to 320 ft. The first discovery was during 1902. A number of other discoveries, confirming an opinion that the body of ore on this lower level has more uniformity than the upper levels, were made during the past year. A shaft is down on the original discovery to the 320-ft. level, and a small amount of ore has been taken from this deeper level. However, more water is met with, creating an expense too heavy for one company, of the usual capital investment of this district, to cope with, and it is apparent that this lower level will remain practically undeveloped until other companies sink for the same ore level and bear a part of the expense of the water problem.

The higher price of zinc ore aided in exploiting mines on the Webb City-Carterville sheet, or blanket, vein deposit. The prices encouraged the removal of a number of mills to mines in this ground. This is a further indication that a lack of prospecting at the proper time to discover free-ore deposits decreased the output of the year. A larger number of mills were in operation than the previous year, but operating in harder ground a less tonnage was produced Producing a less quantity, operating in hard ground and with more water to handle, increased the average operating expenses of the district, it is estimated, $3 to $5 per ton. Outside of possibly a half dozen free-ore mines, working at an expense of $10 to $15 per ton, the general average cost of mining and royalty has amounted to $26 to $28 per ton. Lack of more definite information along this line is attributable to the fact that very few operators keep accounts by which they can arrive at an actual cost and only know the approximate cost when the price of ore recedes to a point below operating expenses. Even then, some will run for several weeks before discovering the shortage.

Marketing.—The mine-owners of the Joplin district producing zinc ore have little need to give thought to the sale of their product, or to its price. nine months of the year, but during the latter part of each year they experience a lower market, and have for years. This condition prevails annually, and, apparently, because the galvanizing trade has enough metal contracted to finish the year's business without recourse to the open market. The withdrawal of the galvanizers from the open market lessens the demand for metal to such a degree that the market is weakened. This, in turn, speedily reacts upon the ore market, and each fall some form of ore restriction or exportation becomes necessary to relieve the bins of operators of a cumbersome reserve stock. It has been said that the operators try to force the smelters to pay too high a price for the ore, but this is due to a misunderstanding. The annual restriction, properly described, is a movement to prevent carrying over the close of one year a reserve stock that may be a menace to prices in the succeeding year. The general idea is to strengthen the ore and metal markets by eliminating a reserve stock. During the past fall there were four weeks of restriction, by which it is estimated that the reserve stock is approximately 8,000 tons less than if the mines had continued unrestricted operation. Prior to the inauguration of restriction, the district was furnishing about 4,700 tons per week. At this rate, in four weeks it would be 18,800 tons. Add to this 7,400 tons reserve, gives a total of 26,200 tons. From this the smelters would have purchased no more than the 12,200 tons taken during that time, leaving a reserve of 14,000 tons. But the restriction of the output left a reserve stock of less than 6,000 tons at its close, December 12. At the same period in 1902 there were over 10,000 tons of reserve stock in the bins of the producers.

The customary method of marketing zinc ore is very simple. The mine operator mines and mills his ore and places it in an open bin, where it is sampled by the purchasing agents of the various smelters. The samples are assayed to determine the metallic contents of the concentrates; the per cent, if any, of iron; the per cent, if any, of lead, and the weight of the moisture accumulated by wet concentration. For iron contents exceeding 1 per cent of the sample, a deduction of $1 for each 1 per cent in excess is calculated. The presence of lead is objectionable to only a few of the smelters, and if it amounts to a fraction of 1 per cent they decline to submit an offer of price unless in particular need of ore. Others pay no attention to the ordinary lead contents in zinc ore. When the samples have been assayed and the ore is suitable to the needs of those smelting it, an offer is made, either on a flat rate, meaning a stated price, with no deductions for either iron or moisture; a straight rate, meaning a stated price per ton, less moisture and iron deductions; or an assay basis, fixing the price on a basis of 60 per cent metallic con-

tents with iron and moisture deductions. If on the latter plan, the seller does not know the price he is to receive until his ore is loaded on the cars, a careful car-sample is taken and assayed, when the deductions are made and the ore settled for at a local office maintained by each of the smelters.

During the past year zinc ore prices were generally high, and the market exceptionally steady, until the second week of October. The year opened with the assay basis at $30 to $31 per ton of 60 per cent zinc, and the highest price at $33.50. Within two weeks the price advanced to $37, holding at from $35.50 to $37 until the first week in March, when it advanced to $38, and the third week of that month to $41. The highest price was reached the second week in April, when $42 per ton was paid for a few bins of concentrates free of iron and lead. From the time the price reached $40, in March, until the second week in October, seven months, the highest price was never less than $40 per ton. It is the longest period in the history of the district that zinc ore prices continued so steady and with so little fluctuation. During this time the assay basis was $36 to $38 per ton of 60 per cent zinc. From October the top price receded gradually, closing the year at $35 per ton, and the assay basis at $26 to $28 per ton of 60 per cent zinc.

For eleven months of 1903 the total shipment of zinc ore from the Joplin district aggregated 219,857 tons, which sold at an average price of $34 per ton, a total of $7,467,225. The lead ore sales aggregated 26,519 tons, and sold at an average of $54 per ton, a total of $1,429,020. Estimating the December shipment at 15,000 tons of zinc ore places the year's total tonnage of zinc ore at approximately 234,857 tons, against a tonnage in 1902 of 262,545, or a decrease of 27,688 tons. Estimating the lead output of December at 2,000 tons will give a year's total of approximately 28,519 tons, against a total in 1902 of 31,625 tons, or a decrease of 3,106 tons. The December estimate would add to the zinc value $500,000, and to the lead value $104,000, bringing the district total value of the year to $9,530,245, against $9,430,890 for 1902, an increase in value of $99,355 in favor of the year just closed.

ANTIMONY IN 1902.

By Joseph Struthers.

There are four sources of supply of antimony in the United States, given in the order of their importance as follows:

1. Hard, or antimonial-lead, obtained from the smelting of both foreign and domestic lead-ores.

2. Antimony regulus, or metal, from foreign sources.

3. Antimony ores (including the so-called crude antimony, which is refined stibnite, antimony sulphide), from foreign sources.

4. Antimony ores from domestic sources.

1. The quantity of hard, or antimonial, lead, produced in the United States during 1903 from the smelting of impure foreign and domestic lead ores amounted to 20,514,000 lb., containing approximately 5,743,920 lb. of metallic antimony, as compared with 20,970,000 lb. hard lead containing 5,808,000 lb. antimony metal in 1901, thus showing a decrease of 456,000 lb. hard lead and 64,080 lb. antimony contained therein. Hard lead contains from 18 to 27 per cent antimony, and is used largely in the manufacture of anti-friction and similar alloys.

2. The quantity of antimony regulus, or metal, imported into the United States during the 11 months ending November 30, 1903, was 5,007,915 lb., valued at $274,363; the exports during this period amounted to 79,917 lb., valued at $4,478. Estimating the net importation for December at the average rate of the preceding 11 months, the quantity for the entire year amounted to 5,463,180 lb., valued at $299,304, as compared with the net importation of 5,388,739 lb. valued at $333,601 in 1902, showing an estimated increase in the importation of regulus amounting in quantity to 74,441 lb., and a decrease in value of $34,297. For all practical purposes antimony regulus is equivalent to the pure metal.

3. The quantity of antimony ore, or crude antimony (partly refined stibnite), imported during the 11 months ending November 30, 1903, was 2,671,122 lb., valued at $51,416. There being no exports, this quantity is equivalent to 2,913,948 lb., valued at $56,088 for the entire year of 1903, as compared with 3,129,069 lb. valued at $62,968 in 1902, showing a decrease in quantity of 215,121 lb., and in value of $6,880.

The antimony content of the ores imported into the United States ranges from 35 to 65 per cent, but the average may be taken at 52.5 per cent, which is equivalent to a smelting return of 42 per cent metallic antimony. On this basis, the quantity of antimony available in the ores estimated to have been imported during 1903 was 1,223,858 lb., as compared with the actual content of 1,314,209 lb. in 1902, showing a decrease of 90,351 lb.

4. There was no production in the United States of metallic antimony from domestic antimony ores during 1903, due largely to the removal, in April, 1902, of the former duty of 20 per cent *ad valorem* on crude antimony. This condition, coupled with cheap ocean freight rates from foreign countries, permits the production of the metal from cheap foreign ores at a cost lower than that entailed in the smelting of domestic ores.

The total supply of antimony in the United States during 1903 and 1902 is summarized as follows in pounds:

	1902. Pounds.	1903. Pounds.	Changes.
Contained in hard lead	5,808,000	5,743,920	D. 64,080
Contained in net imports of ore	1,314,209	1,223,858	D. 90,351
Contained in net imports of regulus	5,388,739	5,463,180	I. 74,441
Total	12,510,948	12,430,958	D. 79,990

The imports are estimated for December only.

The control of the production and trade of refined antimony metal in the United States continues in the hands of the London concern, Mathison & Company, which has a smelting and refining plant at Chelsea, Staten Island, N. Y. Prior to 1902, the Chapman Smelting Company of San Francisco smelted a relatively small quantity of domestic antimony ores, but the quantity of metal annually produced from this source has rarely exceeded 800,000 lb. Due to the removal of the duty on crude antimony (partly refined stibnite) in April, 1902, the Chapman Smelting Company has made no output of antimony metal during 1902 and 1903.

Although many deposits of antimony minerals are located in the Western States, the outlook for their development is very discouraging. The low rates of ocean freights from foreign countries, where the cost of mining is extremely cheap, permits the delivery of ores near the market at a cost so small that the western ores, being in regions where the costs of fuel and labor are high, cannot be profitably smelted at the mines, nor can they be shipped to refineries on account of the high railroad freight rates, hence there is no competition against the foreign product. A large part of the supply of antimony is in the form of hard-lead, obtained as a by-product in the smelting and refining of lead ores. This branch of the antimony industry will naturally survive, and will develop along with the progress in lead smelting.

THE NEW YORK ANTIMONY MARKET.

During the year 1903 the market for antimony has again been rather depressed, and values declined continuously. This is due to the fact that consumption in this country has barely held its own, as also to the cheap offerings of antimonial lead, which latter description could, at nearly all times, be had at favorable figures.

Importations of refined antimony have remained about stationary, but those of ores and regulus showed a considerable increase. Some stocks have probably accumulated, but they are not considered excessive.

The year opened with Cookson's selling in retail lots at 8¼ to 8½; Hallett's at 7 to 7⅛; Hungarian, Japanese, United States Star, French and Italian at 6¾ to 6⅞c. From month to month prices declined, holders being anxious to sell, and ever ready to make concessions in order to dispose of fair-sized quantities.

The market closes rather dull and depressed at the lowest quotations of the year—6¾ to 7c. for Cookson's; 6 to 6¼ for Hallett's; 5¼ to 5½c. for Italian, French, Japanese, Chinese, Hungarian and United States Star. The cheaper foreign brands continue to replace the standard English brands, such as Cookson's and Hallett's, to a marked degree, the quality of the former being said to be very good indeed.

It is not unlikely that, at the lower values established, consumers will take more interest in the article, and a better demand is expected next year, provided, however, that general conditions do not affect business adversely.

TIN IN 1903.

The production of tin in the United States remains, as in previous years, conspicuous by its absence. Recent discoveries in Alaska, however, seem to give ground for the expectation that this condition will not last. The explorations and discoveries, which have been reported in our columns during the past year lead to the belief that we may hereafter be able to report some production of metallic tin from our northern country; though our knowledge of the deposits is still too imperfect to permit us to make any prediction as to its probable quantity.

The production of tin at the present time is mainly from countries in which no exact statistics of output are kept. In estimating the yearly production, therefore, we are dependent almost entirely upon the trade statistics, that is the figures of exports from producing countries and of receipts by the consumers. In the table below we have included the usual figures of exports from the Straits, from Bolivia and from Australia, adding in the latter case an allowance for the home consumption. In addition to this there are the amounts of the yearly sales of Banka and Billiton tin by the Dutch Colonial administration, and the output of the old mines of Cornwall in England. In addition to these a small production is reported yearly in the German statistics, but this tin is either recovered from scrap, or is obtained from imported ores. In a few other countries also there is a very small production, amounting to a few tons yearly. An unknown quantity is produced in China; it is mostly consumed in that country, although exports are made occasionally, and Yunnan tin has at various times been quoted up in the London market. This Chinese production is variously estimated, some authorities having put it as high as 20,000 tons yearly; but it seems probable, from such data as are accessible, that this is rather an over-estimate. As it is impossible to approximate the real quantity, Chinese tin is omitted from the table given below.

The production of tin, as estimated upon the basis of trade statistics, was as follows, in long tons:

	1902.	1903.	Changes.
Straits (Malay Peninsula)	54,062	54,797	I. 735
Australia	3,500	4,991	I. 1,491
Banka	14,978	15,070	I. 92
Billiton	3,951	3,653	D. 298
Bolivia	9,000	9,500	I. 500
Cornwall, England	4,392	4,150	D. 242
Miscellaneous	350	375	I. 25
Total	90,233	92,536	I. 2,253

The consumption of this tin is distributed about as follows: United States, 43 per cent.; Great Britain, 28 per cent; other European countries, 22 per cent; India, China, etc., 7 per cent.

The reports of the Bureau of Statistics show that the imports of tin into the United States for the 11 months ending November 30 were as follows, in long tons:

	1902.	1903.	Changes.
Straits	18,003	17,666	D. 337
Australia	262	222	D. 40
Great Britain	14,633	16,091	I. 1,458
Holland	1,429	1,046	D. 383
Other Europe	475	374	D. 101
Other countries	76	46	D. 30
Total	34,878	35,445	I. 567

The tin imported from Great Britain is chiefly Straits tin, so that the larger part of our supply comes from the Malay Peninsula.

Estimating December imports, the total consumption in the United States approximated 39,000 tons, or about 43 per cent of the world's output.

The production of tin last year—as, in fact, for several years previously—has hardly exceeded the consumption, and from some of the older districts, especially Banka and Billiton, there are signs of a diminution in output. New sources of supply are much needed, but the exploration, which has been constantly carried on, has not been successful unless we assume that the deposits of Alaska may become of permanent value.

A company was organized in this country during the year with the object of erecting tin smelting works, which were to be supplied with ore imported from the Straits. The project failed, however, as the government of the Straits Settlements about that time put an export tax upon tin ore so large as to prohibit the smelting of the material here at a profit. The business has, therefore, remained in the hands of the Straits Trading Company and other concerns which owned smelting works in the colony.

THE NEW YORK TIN MARKET.

The average price for tin in New York during 1903 was about 1.5c. per lb. higher than during 1902, the article being in a strong position in the relation of supply and demand. Production in the Straits remained about stationary. The Banka production for the fiscal year of 1902-03 was announced by the Dutch government as 10,400 tons, against which 15,000 tons were sold, making 4,600 tons out of stock.

According to official figures, stocks of Banka tin unsold on March 31, 1902, were about 14,700 tons, and should therefore now be reduced to 10,000 tons.

The market in January opened rather active, with the quotations at 26¾ to 26⅞. Stimulated by speculative buying both here and abroad, prices advanced by leaps and bounds until 28½c. was reached. Reports regarding smaller shipments from the Straits and reduced sales of Banka tin caused another advance to 29¼ at the end of the month. After a temporary lull in the demand, consumers again started to buy, and the closing quotations in February were given as 29⅝ cents.

At the beginning of March tin again made good its reputation of the most erratic metal on the list. The reported decrease of 1,700 tons in the visible supplies for the month of February, coupled with heavy shipments to the United States, was sufficient to advance values abroad nearly £5 per ton within a few days. The Banka sale went at a surprisingly high level and led to a fresh outburst of speculation. Our market quickly responded and quotations were marked up to 30¾c. At these prices, however, both consumers and dealers restricted their purchases, covering only their immediate requirements. The market consequently became dull, and under free selling from the East, prices sagged, the metal being freely offered at 29½ by the beginning of April. Heavy arrivals from London, as well as from the Straits, caused the metal to sell below the parity of the foreign market during the remainder of the month.

While at one time during May 30c. was paid, 28½ was the highest figure obtainable during the month of June, the article suffering from the poor European demand.

During July the market ruled steady at about 27c., but in August traders took advantage of the scarcity of spot tin and worked prices up to 28c. for early delivery and 27½ for futures.

The official announcement that the Banka sales during 1904 will be for only 55,000 slabs each, being equal to a total of 11,500 tons, which is a reduction from the current year of about 3,500 tons, fell rather flat, having already been to a large degree discounted.

At the end of September, prices declined to 26⅝, at the end of October to 26c., and at the end of November to 25¼ cents.

The course of the market during December was rather erratic, but on the whole the tendency was toward higher values, especially after cables were

Monthly Average Prices of Tin in New York.

Month.	1902.	1903.	Month.	1902.	1903.
January	23.54	28.33	August	28.23	28.29
February	24.07	29.43	September	26.60	26.77
March	26.32	30.15	October	26.07	25.92
April	27.77	29.81	November	25.68	25.42
May	29.85	29.51	December	25.68	27.41
June	29.36	28.34			
July	28.38	27.68	Year	26.79	28.09

received from the Straits, advising continued speculative buying for account of Chinese in Penang and a shut-down of the smelting works of the Straits Trading Company for a week, on account of the ore coming slowly forward from the mines. The movement culminated in a quotation of 29¼ after the Christmas holidays. The closing prices for the year are 28⅝ to 28¾ for spot and futures.

THE LONDON TIN MARKET.

By Our Special Correspondent.

The year commenced with a visible supply of 14,769 tons, including a stock in London of 4,557 tons, the ruling price being £120 10s., cash. Values quickly rose to £133 10s., but eventually closed at about £3 below the highest. The chief cause for this improvement was speculative buying, based on the assumption that the quantity of Banka to be offered at the sale in Holland would be reduced, owing to the strike of dock laborers, and to the idea that production in the future would decrease, whilst the chances were in favor of consumption increasing.

Statistics at the commencement of February showed a big reduction, the London stock standing at 3,872 tons, the visible supply being estimated at 16,151 tons, and prices again moved upwards, until £139 was paid for cash. America came into the market, and bought large quantities both for cash and forward shipment, and there was considerable speculative buying of three months metal, on the idea that consumption in America would increase largely.

By the beginning of March the London stock had been reduced to 3,221 tons, the total visible supply standing at 14,243 tons. The market was active, but prices moved somewhat violently, owing to fresh liquidations of speculative holdings. Large sales of Banka by the Dutch Government, and heavier shipments from the Straits than were generally expected, were both important factors in swaying the market, which was peculiarly sensitive, owing to the small stocks available for the speculative medium, which at the beginning of April amounted to only 2,212 tons; the total visible supply, however, being somewhat heavier at 17,629 tons. The tone of the market quieted down somewhat, and after £139 for cash, touched £134 10s., but rallied before the month was out to about £137. The chief bulls were able, owing to the small supply of warrants, to manipulate the spot market with comparative ease, and large lines were taken up. Considerable uncertainty was caused as to the probable future supplies, owing to the official notice issued that the Banka production for the year 1902 had been only 10,400 tons, while sales had been made at the rate of 15,000 tons yearly, clearly showing that the reserve stock held in the Dutch Indies had been seriously drawn upon, and it was generally thought that sales would have to be curtailed. Americans continued to buy, but not on a large scale, their purchases having been sufficient to meet their requirements for some time ahead.

May saw a further reduction in warrant stocks, which stood only at 2,031 tons on the first of the month, the visible supply also being reduced to 15,604 tons. Prices gave way sharply, owing to continuous and heavy selling by a prominent operator, and down to £124 10s. was accepted for cash. The prominent bulls were quite unable to stay the decline, and the tone at the end of the month was heavy, at about this figure. Consumption at this time showed signs of dullness, both in Europe and America, and although at the beginning of June, London stocks were again lower at 1,970 tons, the visible supply had increased to 17,701. Values moved between £125 and £130, mainly owing to speculation, consumers not showing much inclination to buy.

July opened with the London stock standing at 2,235 tons, the visible supply being reduced to 16,070 tons. The market continued to be of a professional character, and renewed onslaughts were made by the chief bears, who were again successful in driving prices downwards, until about £119 15s. was accepted for three months; but cash metal, which was firmly held, did not suffer to the same extent, only declining to £122. The tin-plate trade at the time was bad, and English consumers were only moderate buyers. But America sent orders over toward the end of the month, and rather more speculative buying was indulged in, principally on Continental account, induced by the announcement that the Dutch Government would sell 3,300 tons less in 1904 than in 1903. This buying caused an improvement to £128. cash, and £124 10s., three months.

The visible supply at the beginning of August had increased to 18,102 tons, London stock also being augmented considerably, and amounting to 3,556 tons. This increase in stocks was a bad feature, and prices fell away considerably during the month, although at first there was some artificial firmness, due to the great scarcity of cash warrants, which at one time commanded £130 10s.; but with renewed selling, a falling off in trade in America, and a reduced demand from the Continent, there was a smart decline to £123 5s., cash, and £121 10s., three months, and the month closed at only a shade of advance from the lowest level.

September statistics gave the visible supply at 17,538 tons, the London stock, however, being increased to 4,651 tons. As can be easily imagined, this constant piling up of stock in London caused a free market in spot metal, resulting in the disappearance of the backwardation in forward prompts, and a small contango had to be paid for forward before the month closed. American and English stock markets being demoralized had a bad effect on this metal, and there was heavy selling by stale bulls, which forced values to £111 10s., cash, and £112, three months, which, however, proved to be the lowest mark of the year, and there was a recovery to £115 5s., cash, and £115 15s., three months. Consumption was restricted, and in the all-round unsettled state of trade and finance buyers withheld their orders until absolutely forced to buy.

A further increase in both the London stock and visible supply was declared at the beginning of October, the former standing at 5,053, and the latter at 18,158 tons. The lower values brought forth a better demand from European consumers, and there was large speculative buying in the East and on the London exchange, which was generally thought to be for Chinese account. Closing values for the month were £118 5s., cash, and £118 15s., three months.

November commenced with heavy reductions in London stocks, which stood only at 3,886 tons, the visible supply also being lowered to 15,549 tons. Fluctuations were confined to narrow limits, but there was again very persistent buying by houses connected with the East. Continental consumers were free buyers, but prices did not improve, owing to these purchases being met by free sales from the Straits, which were probably induced by the weakness in silver, which seriously affected the rates of exchange. America remained very passive, owing to the extreme uncertainty of the future of the iron and steel trades. Closing values were £118, cash, and £119 5s., three months.

December saw another shrinkage in London figures, which were given as 3,721 tons, the visible supply at the same time standing at 15,471 tons. The early part of the month witnessed a large speculative business, causing values to improve almost daily until £132 10s. was touched for cash. East-

ern operators continued to buy, and outside speculators followed, presuming that the continued purchases must be based on definite news as to the course of future production.

Later in the month a further sharp advance took place upon the receipt of news to the effect that the Straits Trading Company was shutting down their smelting works for a week, on account of the ore coming forward slowly from the mines. The closing quotations of the year are given as £132 15s. for spot, £133 10s. for three months.

ALUMINUM.

By JOSEPH STRUTHERS.

It has not been practicable to obtain exact statistics of the production of aluminum in the United States during 1903, the sole producing concern, the Pittsburg Reduction Company, having declined to report its output. The production in 1902 amounted to 7,300,000 lb., and, judging from the extension of the uses of the light metal and its alloys for construction and decorative purposes, coupled with the large increase in the production of bauxite in the United States during the year, it is fair to assume that the output of aluminum in 1903 was larger than in the preceding year, and approximated the total of 7,500,000 pounds.

The chief point of interest affecting the aluminum industry in the United States during the year under review was the final adjudication of the litigation between the Electric Smelting & Aluminum Company and the Pittsburg Reduction Company. Suits and counter-suits were brought on behalf of the two companies, from time to time, until finally in October, 1903, the United States Circuit Court of Appeals rendered a decision against the Pittsburg company for infringement of patents since 1892, involving a sum very near to $3,000,000. A compromise was effected on October 31, 1903, between the contesting concerns, whereby a large sum of money was paid by the Pittsburg Reduction Company for past infringement of the Bradley patents controlled by the Electric Smelting & Reduction Company, and an agreement was then entered into by which the Pittsburg Reduction Company was to continue the manufacture of aluminum under license of the Bradley patents until their expiration in February, 1903, paying a royalty on all metal produced. By the terms of the agreement the Electric Aluminum & Reduction Company will restrict its operations to the manufacture of alloys, although it may handle and sell aluminum in all forms at the works in Lockport, N. Y. The settlement involves, also, an agreement by the Electric Smelting & Aluminum Company not to appeal the old case of the Pittsburg Reduction Company *v.* the Cowles Electric Smelting & Aluminum Company, wherein the latter company was enjoined by the United States Circuit Court from manufacturing aluminum metal.

The new plant of the Pittsburg Reduction Company at Massena Springs, N. Y., was completed in September, 1903, and put into operation. The equipment includes four 300 h. p. sets generating current at 500 volts, and provision is made to increase the works as the demand for aluminum grows, until ultimately 12,000 h. p. will be used. At present the St. Lawrence Power Company supplies the electric current used by the plant. A plant has been installed to manufacture the carbon electrodes employed in the reduction furnaces, and a wire mill is under construction.

At Niagara Falls, N. Y., a carbon-electrode department, similar to the one at Massena Springs, has been added to the company's works. An electric furnace is said to be used at this plant for the purification of bauxite.

Prices.—Notwithstanding the increased demand for aluminum, resulting from the more extended use in the manufacture of electric conductors, in the construction of parts of machines and apparatus which require lightness rather than great strength, in the manufacture of culinary utensils, decorative articles and new alloys, the prices quoted for 1903 have remained unchanged from those of 1902 and 1901. These prices are detailed in the subjoined table:

Prices of aluminum and its alloys in cents per pound.

Products.	Small lots.	100-lb. lots.	1,000-lb. lots.	2,000-lb. lots.
No. 1 (al., 99.75%)	37	35	34	33
No. 2 (al. 90%)	34	33	32	31
Nickel-al. casting metal (10% ni.)	39	35	34	33
Special casting alloy (80% al.)	35	30	29	27

Alloys.—A very interesting résumé of the progress that has been made in the manufacture and uses of aluminum alloys was given by Prof. Joseph W. Richards in a paper read before the American Society for Testing Materials, at Delaware Water Gap, July 3, 1903, a brief abstract of which was published in the ENGINEERING AND MINING JOURNAL, October 3, 1903. Of the numerous alloys mentioned, those with zinc are the cheapest and most efficient. Zinc-aluminum alloys containing up to 15 per cent zinc are malleable and ductile, and castings containing as high as 33 per cent zinc, when formed in sand moulds possess a tensile strength of 25,000 lb. per sq. in., and when chilled of 40,000 lb. per sq. inch.

Thermit.—One of the most promising fields for the consumption of aluminum is the so-called thermit process, invented by Dr. Goldschmidt, which produces an intense heat by the oxidation of metallic aluminum in intimate contact with metallic oxides. The utilization of the heat so produced is of great value for welding in place steel rails and broken iron or steel castings; for reducing refractory oxides of rare metals, yielding a metallic product free from carbon, chiefly tungsten, chromium and molybdenum, and for preventing the formation of large pipes in the tops of steel ingots. A considerable advancement in these specialties has been made abroad, but, so far, but little has been done in the United States. For the conduction of the electric current, especially in trolley lines, the great advantage of welding both the track and the third rails is obvious, for the reason that the ends of adjacent rails may be welded together without removal from the track at a cost stated to be less than the usual connection by means of fish-plates and copper binding wires; and when the rails of a track are welded in this manner, they are practically continuous and the connections permanent, which avoids the frequent and costly repairs so necessary to maintain a perfectly good conductor for the electric current. During 1903 no less than 20,000 track-joints were made by the thermit welding process. The system has been introduced in the cities of Leeds, Glasgow and Nottingham, and an English company is using the process for welding 25 miles of rails in Singapore.

For the welding of wrought-iron pipes the thermit process has been largely used, between 30,000 and 40,000 joints having been made by it. This method is cheaper than the usual flange-joint, and is of special value for pipes or tubes under high pressure, or for the transportation of liquids such as alkalies, petroleum, which attack the materials commonly used for packing.

NEW CALEDONIA.

By F. DANVERS POWER.

The bulk of the New Caledonian nickel properties are held by two companies, the International Nickel Company of New York, which, among others, has absorbed the Nickel Corporation of London, and La Société le Nickel of Paris. There is also a new Paris-London flotation under the name of the Consolidated Nickel Mines which has taken up some much inspected properties owned by the Société d'Exploitation at Koniambo, Katepai, Poya-Mueo, Bourail, etc. The intention of this concern is to treat the ore forthcoming from these mines at the works of the Smelting Company of Australia, Dapto, N. S. W., a contract to this effect having been made. In view of the fact that the market price of nickel is under the control of the first above mentioned American and French companies, it remains to be seen how this new company will dispose of its products at a profit.

Gauged by the exports the production of nickel ore has been going on at a reduced scale during the past year as compared with 1901 and 1902. This is largely due to the fact that the Americans rushed ore home during 1901 and 1902 in anticipation of a possible change in Canadian legislation, consequently they had a large stock to work off, and the French during the same period shipped large quantities of ore in order to replenish their reserves on which they had largely drawn while previous high freights had prevailed.

The net profit of the Société le Nickel for 1901-1902 was 2,306,305 fr. as against 1,982,747 fr. for 1900-1901. This has enabled the company to pay a dividend of 25 fr. per share, as against 22.5 fr. for the previous year, and this in the face of the fact that the capital has been increased from 10,000,000 to 15,000,000 fr. by the issue of 20,000 new shares. The company is constructing an aërial plant which is prolonged into the sea, by means of which ships lying off shore can be loaded; in this way it is hoped to economize 23 barges and 200 men.

Owing to a temporary increase in the demand for cobalt, and the consequent increase in price, there was an over-production in the early part of the year, which soon had the effect of lowering prices, and bringing matters down to their usual condition again.

Chrome mining has been given a great lift by the way in which the mines at Tiepaghi, in the northwest of the island, have turned out. This property belongs to the Société le Chrome, but has been let on a royalty basis for a period of four years; the right to mine for the unexpired portion of this period, a little over three years, has recently been purchased by the tributers for the sum of $200,000, during which time they hope to raise 100,000 tons carrying an average of 55 per cent sesquioxide of chrome. The anticipation of large outputs of chrome from New Caledonia has had the effect of unsettling the market price of this metal both in America and Europe.

Different chrome interests in New Caledonia located at Tiepaghi in the northwest and at Plum and Baie du Sud in the southwest were formed into one company at Paris during the year, under the name of the Société le Chrome. This company has worked some of the properties controlled by it at Plum, principally the old Lucky Hit mine. Tramways have been laid down and other preliminary work carried out in order to get ready for transporting ore to the coast. So far as Plum is concerned, it is reported that there exist large deposits of rock chrome of a very hard nature, in which state it is not marketable, being below 50 per cent sesquioxide; therefore a concentration plant has been erected. As to the Baie du Sud properties, there is no reliable information as to quantities of ore available. A sudden stoppage to the operations of the above company was due to litigation in Paris, the object of which seems to be to liquidate the company just formed, which will retard production from that quarter for the time being.

M. Colomer, an engineer, was sent out by the French shareholders in the coal properties of the Noudoue basin to report on the seams. He put on a number of men for a time and did considerable work, but nothing further has been done since.

For want of the necessary funds, the railway line in course of construction from Noumea to Bourail has had to stop short at Dumbea, the first section.

NOTE.—The ENGINEERING AND MINING JOURNAL is desirous of obtaining certain back numbers and volumes, and would be willing to pay a liberal price for them. Those wanted are Volume 54 (1892), complete; No. 19 of Volume 51 (May 9, 1891); Nos. 3 and 24 of Volume 60 (July 20 and December 14, 1895); the Index to Volume 63 (1897) of the ENGINEERING AND MINING JOURNAL. Anyone having any of these numbers to dispose of will oblige by informing us as soon as possible.

MINING IN MEXICO.

By Jas. W. Malcolmson.

During the year there has been an immense influx of American capital into Mexico, due to several causes. The labor troubles in several of the principal mining camps of the United States, the fact that mine prospecting and development in Mexico requires less capital than in the regions north of the Rio Grande, and that there is a large area of territory still remaining unexplored, are some of the reasons.

Most of the newer enterprises are still in process of development.

Asientos.—A notable example of successful operations in silver mining and the possibilities of a mining enterprise, even when conducted on a small scale at the beginning, is well shown at the Santa Francisca mine in Asientos, State of Aguascalientes. Here an old mine which had been full of water for one hundred years was pumped dry at a cost of less than $40,000, Mexican currency. This mine, with considerable ore in sight assaying over 45 oz. silver per ton, was found to have been abandoned, perhaps on account of one of the numerous revolutions which formerly swept over the country, or the insufficiency of the means for handling the water.

Since March, 1902, to the present time, an ore-body has been opened up on this property 2,180 ft. long and 50 ft. wide, assaying 45 oz. silver per ton; a railroad eight miles long has been built to the property from the Mexican Central Railroad at San Gil; 20,000 tons of ore have been mined from development work and 500,000 tons of ore are conservatively estimated as in reserve. All this work has been accomplished at a cost not exceeding $300,000 United States currency, and a very large profit is already assured. This mine now belongs to the American Smelting and Refining Company.

Parral.—In the north of Mexico a great deal of capital has been invested in the silver mining camp of Parral; the main producers are the Quebradillas, Refugio, Santa Ana, Tajo, Los Muertos, Terrenates, Caldas and Palmillo. The well-known mine of Pedro Alvarado, El Palmillo, has maintained its production during the year, but the mine has never given more than a fraction of the wealth popularly estimated. During the past three years the Palmillo mine has produced 1,200 tons per month of ore assaying between 40 and 50 oz. silver per ton, and 0.2 oz. of gold per ton. This was worth $1,000,000, United States currency, after deducting freight and treatment. The net profits, after deducting cost of mining, were probably $500,000, United States currency, for the three years. Operating expenses on this property have always been higher than would have been the case had the mine been conducted as an ordinary commercial enterprise.

This mine has now been worked to water-level, 600 ft. from surface. The Parral district, which affords the chief supply of silicious ores for the smelters in the north of Mexico, has suffered toward the latter part of the year, on account of an over-supply of silica, caused to a large degree by the reopening of the Tombstone mines in Arizona; as a consequence, treatment rates have been raised throughout the district. The reopening of the lixiviation mills is under consideration.

Many of the principal mines of Parral have now been worked down to the water-level, and require pumping machinery on a large scale to maintain production. The mines so affected are the Preseña, La Prieta, El Tajo, San Juanico, Cabardeña, Jesus Maria, Sierra Madre, and many others. The district is an old one, and maintains its reputation and output.

The San Francisco del Oro mines have been transferred to an English company. Extensive development and a large installation of machinery is under way to put the mines on a dividend-paying basis.

In the *Santa Barbara* district the Tecolotes Company, controlled by the Messrs. Guggenheim, has operated two units of the concentrator, besides shipping a good deal of low-grade lead carbonate. This mill is operated by gas engines, using producer gas, and is a good example of a plant with a large capacity using Bartlett and Wilfley tables. The mill of the Montezuma Lead Company was worked to full capacity most of the year. This mill uses Hartz jigs, removing most of the lead; and the gold-bearing tailings are re-ground in seven Monadnock Chilean mills. The capacity of the mill is 450 tons per day. The magnetic separation of a zinc-blende free from precious metals has been satisfactorily effected here. The mill middlings, containing 25 per cent zinc, are made into a 50 per cent zinc product, while the lead, iron and copper from the magnetic separation are shipped to the San Luis Potosi smelter.

The Alfereña Mining Company is now grading for the erection of a 150-ton concentrator.

A main adit, the El Toro, is being pushed to open up the ground acquired by the No. 2 smelter of Monterey.

During the year the Torreon smelter has secured mines in Santa Barbara, and the erection of a concentrator is now under consideration.

In *Amaloya*, the Cigarrero mine is producing 2,500 tons monthly of high-grade silver-lead carbonates, carrying some gold. This ore was found only a few months ago, but there is already a large tonnage in sight. This is a new district; it is now being rapidly developed, and apparently has a bright future.

The silver-lead carbonate deposits in the Cretaceous limestones of northern Mexico are steadily increasing in importance, and nearly every year finds a new mining camp to its credit. Prospecting in these northern deserts is difficult, on account of the absence of water, supplies and labor, but there is no doubt that many more deposits will be found. Among the districts now being exploited may be mentioned the Sierra Mojada, Santa Eulalia, Mapimi, Monterey, Villaldama, Terrazas, Minillas, Naica, Muzquiz, Cerralvo, Carmen, Velardeña, Amaloya and Vacas.

Santa Eulalia.—In the Santa Eulalia mines, near Chihuahua, a uniform output of leady ores has been maintained during the year. The ore-shoots of this district are of enormous size, being over 1,000 ft. long, 200 to 400 ft. wide, and over 900 ft. in vertical extension, and still continuing downward. The problem of supporting the ground has always been a difficult one, and a number of very disastrous caves have characterized the history of ore extraction in this camp. During 1903 the caving of many thousands of tons of lead carbonate ore in the old Santo Domingo mines caused some uneasiness, but, happily, occurred without loss of life. One of the largest ore-bodies in the camp is being mined without any supports at all for the roof, and the hole which is gradually being opened out is one of the sights of the district. This camp has always suffered from lawsuits regarding titles and side-lines, and 1903 has been no exception to the rule.

GENERAL VIEW OF EL ORO, MEXICO.

In the *Sierra Mojada* the tonnage mined is diminishing, and the grade of the ore shipped lower than during any previous year, although some new strikes of importance were made in the Fortuna and Fronteriza mines. It is only due to the fact that the smelting companies need these leady and lime ores to run their plants that mining operations are maintained at their present level in this district.

The smelting industry has helped the mining business to a remarkable degree in the north of Mexico. As a rule, the northern ores cannot be treated in mills without considerable loss of value, and the extension of smelting enterprises has enabled mines to be operated at a profit with a comparatively small investment which could not be handled at all formerly. It is estimated that ten years ago 85 per cent of the total ore mined in Mexico was treated at the mines with a loss of 20 per cent of the contents. To-day 85 per

cent of the ore mined is shipped to smelters, and the loss in treatment is less than 5 per cent. The miners are not required to invest heavily in milling plants, and very much larger profits are made.

Ocampo.—A typical illustration of the old method is still to be seen in the Jesus Maria, or Ocampo, district, in the State of Chihuahua, a camp which railroads have not yet benefited. In this district there are dozens of good mines carrying high values in gold and silver, and when the camp is reached by a railroad it will become one of the most profitable in the country, as most of the ore now being indifferently treated in local mills will be shipped to the smelters.

In the *Sierra Madre* range the gold-silver properties are steadily receiving more attention. The purchase of the Dolores mine by the Mines Company of America, in conjunction with English capital, will probably stimulate development in the surrounding country. At the Dos Cabezas mine, north of Dolores, a concentrating plant has just been introduced, but the owners are apparently still hesitating as to the method of handling their high-grade gold-silver tailings.

Lluvia de Oro.—Along the proposed route of the Kansas City, Mexico & Orient Railway a very remarkable gold prospect, the Lluvia de Oro, has been taken up by Los Angeles capitalists. The ore is found as a series of quartz outcrops in limestone, without any very well-marked strike or dip, except for short distances.

The gold content of these quartz enrichments is very high indeed, being in some places as much as 11 oz. per ton. A general average sample of all the quartz exposed when the company started work showed 3 oz. gold per ton. This property has been described as the best prospect in America, and the present operators have a chance to open up one of the great gold mines of the world if the outcrop values are maintained in depth.

Baquerachic.—Near the Lluvia de Oro property, and in the same limestone formation, a copper deposit, the Jesus Maria de Baquerachic, only needs railroad facilities to make it a producer of importance. The ore is copper sulphide, carrying 5 oz. of silver and 0.1 of an ounce of gold per ton. The property has been known for many years, and figured in the war of the French intervention. Several thousand feet of development work has been done in the decomposed contact matter where the deposits are found, but until quite recently the workings have been inaccesible, owing to rotten timber and consequent caving ground.

Mapimi.—In Durango, the Peñoles Mining Company, at Mapimi, has maintained its output, and seems to have overcome its difficulties with the sulphides and arsenic found in the lower levels of the mines.

This material is now about to be handled by the Huntingdon-Haberlein process, which consists mainly of a forced draught through the red-hot ore, oxidizing and carrying off the greater portion of the arsenic and sulphur, leaving the resulting product sintered and in excellent condition for the blast-furnace.

At *Velardeña* a railroad has been built, 22 miles long, to the copper mines, and large expenditures are being made by the Guggenheims and the American Smelting & Refining Company in a power-plant, concentrator, etc. It is not improbable that the smelter will be entirely remodeled and operated again.

The Descubridora Copper Mining Company, near Conejos, on the Mexican Central Railroad, has shut down its smelting plant temporarily, and is doing extensive development in the mines.

At *Tejamen*, the silver mines of Mr. Octaviano Cornejo have been closed down, and the town has been almost depopulated.

At Tepezala, in Aguascalientes, El Cobre property has ceased shipments of ore, pending further development. The Fortuna and other properties have made a good showing during the year.

Zacatecas.—The Veta Grande mine has maintained a regular production of high-grade silver ore. The San Rafael mines of the Stilwell corporation are in full operation.

The Mala Noche mines are being operated by Mr. G. C. Palmer, and it is reported that the American Smelting & Refining Company is backing the enterprise.

Mazapil.—Mining operations have been somewhat more active at Mazapil than formerly. A branch of the Coahuila & Zacatecas Railway to San Pedro de Ocampo has been built, and the mines, which carry lead and copper as well as silver and gold, will probably be more extensively explored and developed during the ensuing year.

Guanajuato.—An immense amount of mining exploration and development has been accomplished. A very extensive electric power plant has been inaugurated, and mill construction has gone forward on a large scale. The coming year will no doubt see very profitable results from these enterprises.

The camp of Pachuca has maintained its usual production, and numerous new ore-strikes are reported.

At *Tezuitlan*, State of Puebla, considerable prospecting has been done, but so far the ore-body of the Tezuitlan Copper Company seems to be the only deposit of importance in the district, although some good ore has been found at Zautla carrying copper, silver and gold. The best mine there, the Armando, seems to have a very promising future. The camp of Tetela de Oro has also received considerable attention. At Tezuitlan there are two Herreshoff furnaces in operation, which smelt the roasted ore. The ore treated is roasted in stalls, and assays 7 per cent copper, 4 oz. silver and 0.03 oz. gold per ton. Fifteen tons of copper are bessemerized daily, and the zinc contents, 10 per cent, are entirely eliminated.

At *Ocotlan*, in the State of Oaxaca, there was great excitement during 1903, on account of some phenomenally rich gold-quartz outcrops which were found, but the district as a whole has not held its own, and it is very much handicapped by the long distance and the high freight rates to the smelters, together with the unsatisfactory character of silver-gold milling, as conducted locally.

El Oro.—Gold mining has been most successful during 1903 in the mining district of El Oro, State of Mexico, and its extension toward Tlalpujahua, in the State of Michoacan. El Oro Mining & Railway Company made probably the best record of any company in the Republic. Mining in this district is stimulated on account of the large profits in sight and the fact that gold is produced by silver-paid labor. El Oro mine has immense ore reserves, there being over 600,000 tons of ore blocked out in the mine, and very much more practically proved and in process of development. In addition to this, there is a large area of unprospected ground in the property.

During 1903 El Oro Mining & Railway Company took up the adjoining properties, the Somera and the Mexico, and regular profits are now assured at the rate of $1,000,000 annually.

The adjoining mine to the north, the Esperanza, with reserves capable of yielding a net profit of $2,000,000, United States currency, has been secured by the Messrs. Guggenheim.

Not very far from these properties, in the Dos Estrellas mine, which was merely a prospect two years ago, there have been discovered and opened up enormous bodies of high-grade silver-gold ores. Two veins have been cut in bonanza, and an 80-stamp mill and cyanide plant have just been put into commission. If this mine continues its development for another year as it has done during the past 12 months, it will be one of the great mines of the country.

The mines of this district are quartz-veins in shale, covered by an andesite capping of some thickness, and a large number of properties are being exploited with the object of discovering and exploring veins below this cap. Although most of these properties are still without any definite outlook, a very large amount of exploration is being carried on in this ground, and it is probable that some of the operators will succeed in developing dividend-paying properties.

Cananea.—The successful development of the copper deposits in the north of Sonora has gone steadily forward. The Greene Consolidated Copper Company increased its production to 325,000 tons of ore and 130,000 tons of flux, while the production of metallic copper is now 60 tons per day. The grade of the ore handled is not so high as during 1902, and concentrating machinery which will handle over 50,000 tons monthly is under process of construction and improvement.

Nacozari.—The mines in this district will be reached in the early part of 1904 by the railroad now under construction, and on the completion of the new smelter at Douglas it is probable that the Nacozari concentrates will be shipped to that point for smelting.

Considerable attention has been given during the year to the copper region on both sides of the Yaqui river, but so far no mine of importance has been opened up. A number of smelting enterprises are under way, and the results of mining development are very encouraging, but the absence of transportation facilities is a serious drawback to operations there. This is the chief hindrance to successful mining in southern Sonora, but where high-grade ore is mined, or rich concentrates produced, such as those at La Bufa and La Dura, excellent results are obtained. A very promising mining country is being opened up by the Phelps-Dodge railroad, from Douglas to Nacozari, and many mines in this neighborhood have made a very good showing during the year.

After all, in any review of mining in Mexico, or in any other country, the most important point is the profit made on the investment or the probabilities that future profits will be obtained.

General.—During 1903 a great deal of money was earned in Mexican mining operations. Rich strikes have been made; old camps, such as Parral, Pachuca, Guanajuato and many others, have maintained their ancient reputation and output. This is in addition to the new fields constantly being opened up, and puts the Republic of Mexico in the foremost, to-day, as a good field for the profitable investment of capital. Great satisfaction is felt over the progress of the past year. The very prosperous results of the work done will continue through the coming year, and there is very little doubt that the progress in the mining of copper, lead, silver and gold will see Mexico far beyond any present conception in 10 years from now.

There are first-class opportunities for speculation and investment in Mexican mining, both for small capitalists and large ones, but industry, close attention, intelligence, a knowledge of the business, and, above all, common sense, are as urgently required and as indispensable for successful mining investment in Mexico as anywhere else.

The Mexican native operator is a shrewd miner, economical and persistent, but he is not, as a rule, able to handle a mining enterprise requiring considerable exploration in barren ground, or to organize a low-grade proposition and handle it intelligently on a large scale. Nor is he able to handle machinery efficiently or operate milling plants requiring skilled chemical knowledge and constant vigilance, and it is along these lines that the American investor usually succeeds. Probably the easiest road to successful mining investment in Mexico is by entering the numerous old mining districts, as they are gradually being reached by the railroads; because the increase in value and possibilities of an old mining camp, by improved railroad communication, are rarely grasped in time by the local operators.

Cleavage is from the Anglo-Saxon *cleofan*, and describes the tendency of a rock to split in a given direction. It is more correctly applied only to true slaty cleavage, the characteristic of which is that it is across the bedding-planes of the original sediments. It is imputed to the effects of lateral pressure, and is accompanied by deformation of the minerals constituting the rock. When an argillaceous (that is, containing clay) rock splits in an uneven short manner along lines approximately parallel to the supposed bedding-planes it is said to have a 'shaly fracture,' instead of a distinct 'cleavage.'

ONTARIO.

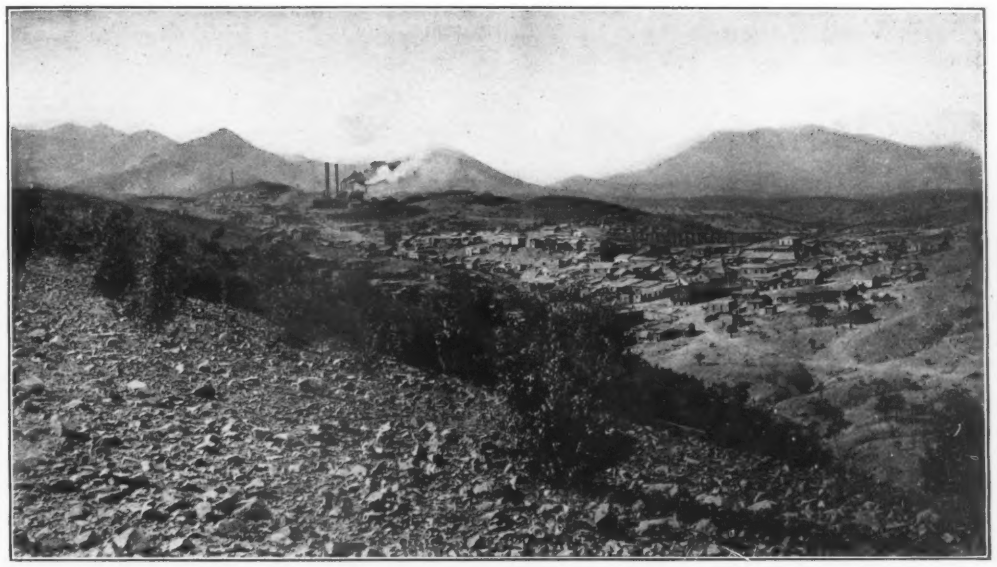
By Thos. W. Gibson.

The year 1903 has seen the mining industry of Ontario make considerable progress in some departments. The chief metallic products of the province are nickel, copper and iron; the principal non-metallic are petroleum, natural gas, salt, mica and corundum, besides building materials of various kinds.

Nickel is mined in the well-known Sudbury region, the ore being a mixture of pyrrhotite carrying nickel and copper pyrites. The principal producers are the Canadian Copper Company, which is the operating branch of the International Nickel Company; the Mond Nickel Company, and the Lake Superior Power Company. The Canadian Copper Company's operations are on a larger scale than those of the other two companies together. When the so-called "combine" was formed, about two years ago, the consolidated company came into possession of several well-developed and productive mines and a large reduction plant that had grown up as the business expanded, and which was consequently somewhat out of date. The new company at once set to work to remodel the plant, and now have the new works well on the way to completion. The old furnaces of 150 tons capacity have been replaced by smelters capable of treating 600 tons per day. Other improvements have been introduced, such as mixing a considerable proportion of green, or unroasted, ore with roasted ore in the smelter charges. It is intended also to do away with the calcines in which, after pulverization, the matte is re-roasted previous to being smelted the second time, and to substitute the bessemer process by which the low-grade matte is converted into a matte carrying 80 per cent and upward of nickel and copper. The company's mining operations are now largely confined to the Creighton mine, a huge deposit of high-grade ore in which open-cut or quarrying methods are yet carried on. Copper Cliff and No. 2 mines have also been worked; the former is now down to the fourteenth level. When completed, this company's equipment will be of a most modern and efficient kind.

NATIVE COPPER IN STOPE AT CANANEA.

At the Victoria mines the Mond Nickel Company ceased raising ore some months ago, and the workings have filled up with water. Smelting has continued for the purpose of converting all the ore on hand into bessemer matte, both from the company's own mine and from the North Star, a property held under working bond. At the company's works here and at the refinery at Clydach, Wales, a large quantity of 80 per cent matte is stored for future treatment. The financial troubles which have proved too much for the Clergue companies brought the Lake Superior Power Company's operations at the Elsie and Gertrude nickel mines to a close. Not much actual mining had been done at either mine for a year or so, but at the Gertrude ore-bodies of considerable size were opened up, and both properties were looking better, when the stoppage came, than at any previous time. All the matte produced by the smelter remains on hand.



GENERAL VIEW OF CANANEA.

Just before snow fell some remarkable discoveries of nickel, cobalt and silver ores were announced from a point along the line of the new government railway, about five miles south of Haileybury, an account of which was given by Prof. Miller in a recent issue of the Journal. The nickel occurs as niccolite and the cobalt as smaltite. The latter predominates in quantity, so far as known. Native silver occurs abundantly in association with the niccolite. The ground is now covered with snow, and all exploration work for the season is at an end. Hence it cannot be said whether or not other deposits exist besides those already known. The rock formation is slate or slate-breccia, formerly classed as Huronian but now suspected to belong to the Animikie horizon, and so probably equivalent to the silver-bearing rocks of the Port Arthur district. Should these cobalt-nickel-silver-arsenic ores prove to be in quantity, the deposits will undoubtedly be valuable, and their discovery illustrates anew the mineral possibilities of northern Ontario.

The output of nickel for the first nine months of 1903 amounted to 5,393 tons, valued in the matte at $2,115,957, which is nearly equal to the entire production of 1902.

The nickel-copper ores of Sudbury are also the principal source of the copper produced in Ontario, but two or three purely copper mines north of Lake Huron and one west of Lake Superior now contribute their quota. Up to the end of October the equivalent of 3,911 tons of copper was raised, this being valued at $330,263.

The chief producer of iron ore for the year was the Helen mine in the Michipicoton division. This mine was the property of the Lake Superior Power Company, and as such has been shut down in the general stoppage of the Clergue enterprises. It is believed that there remains in the mine a large quantity of good ore. The Radnor magnetite mine in Grattan township and one or two properties in Hastings have also been worked. The total output for the first nine months of the year was 262,409 tons, valued at $376,103.

Coke pig iron has been produced by the Hamilton Steel & Iron Company and the Canada Iron Furnace Company, and charcoal-iron by the Deseronto Iron Company. Up to the 31st of October the united product was 59,793 tons, worth $1,051,940.

There has been a shrinkage in the production of gold in Ontario as compared with former years, the output up to the end of October being 7,693 oz., worth $138,210. The mines in the Manitou region of western Ontario are taking on importance. This group includes the Big Master and Twentieth Century. No stamps are operating on Lake of the Woods but the old Sultana, which has once more fallen into the hands of its original proprietor, Mr. J. F. Caldwell; this mine has been unwatered and is now being prospected. In eastern Ontario the Deloro and Belmont mills are both at the moment closed. The latter, which has 30 stamps, it is thought, will soon be reopened.

Nothing much has been done in the silver mines

of the Port Arthur district this year, the total output up to the end of October being 19,549 oz., worth $10,184.

A zinc mine north of Kingston has been successfully operated, the output for the first nine months being about 950 tons.

The Paleozoic rocks of older Ontario yield a variety of useful substances, among them being petroleum, natural gas, salt and gypsum.

The oil-field of southwestern Ontario is peculiar because of the great number of wells it contains and their small average production, which is perhaps not more than one-quarter of a barrel per day. The yield last year was about 18,000,000 imperial gallons; it has been declining for several years, and is showing continued signs of diminution. Owing to the refining interests which have taken root in the oil district, the suggestion has been made that crude oil from the United States be allowed entry into the country under a tariff of 2 cents per gallon, instead of 5 cents. This proposition, however, has aroused considerable opposition, and the prospects of its adoption are doubtful. The Raleigh oil-field, where a gusher was struck in 1902, has not proved very productive; but in the township of Romney the United Gas and Oil Company made a good strike this year. Natural gas is disappearing from the Essex field. The exportation to Detroit was stopped two years ago, but no augmentation of the supply succeeded. In the Welland field a considerable volume of gas is still obtained. The supply there is being husbanded, and several productive wells have been sunk during the year. The principal market for the gas is in the city of Buffalo. Gas is also obtained at Dunnville, near the mouth of the Grand river.

Salt and gypsum continue to be raised, the former in considerable quantity, and the latter to a small extent only. The salt beds of southwestern Ontario underlie the eastern margins of Lake Huron, Lake St. Clair and the St. Clair and Detroit rivers. The chief producer is the Canada Salt Company at Windsor. The output of mica was greater in 1903 than in previous years, and Ontario now ranks as one of the principal sources of this useful substance. Statistics are not yet to hand, but the production will compare favorably with 1902, when the returns showed 999 tons, with a value of $102,500. The General Electric Company has been operating the Lacey and Hanlan mines, both near Sydenham. The Lacey mine has the distinction of producing the largest crystals of amber mica yet found. Size has, however, ceased to be the important feature in mica that it used to be, since the invention of micanite, which enables the smaller sizes to be utilized. The Westinghouse company is also drawing supplies of mica largely from Ontario, the amber variety being especially suitable in the manufacture of electric apparatus.

The corundum fields of Ontario are being exploited by the Canada Corundum Company and the Ontario Corundum Company. The former, which is the pioneer concern, is constructing a new mill of increased capacity near Craigmont, which is expected to be in operation about the 1st of July next. The company continues to produce grain corundum in all sizes and of fine quality. The Ontario company's mines are in the township of Carlow, but the occurrence is identical with that of the Canada company's mines. They sort the corundum ore, and then ship it to the United States for crushing and separation. Some other properties in this neighborhood have been disposed of to a Buffalo concern called the Corundum Refiners, whose design it is to establish a corundum business and erect a mill.

A fine grade of potash feldspar, adapted for use in the pottery trade, is being largely exploited along the line of the Kingston and Pembroke Railway, particularly near Verona. This business has expanded considerably during the past year and is capable of still further increase. The product goes to New Jersey and Ohio.

Several deposits of iron pyrite have been worked in the province during the past year, chiefly in the county of Hastings. The output in 1902 was 4,371 tons, and this is likely to be much exceeded during the present year.

Other mineral products of eastern Ontario are actinolite, graphite, talc and arsenic, all of which have been raised to some extent during the present year. There are many deposits of graphite in the province, and a good demand exists for the article, especially in the British market. There are, however, difficulties, in treating the ore which have not yet been entirely overcome.

The trade in building materials was brisk in 1903. Limestone was quarried in large quantities, not only for buildng purposes, but also for the many other uses to which it is now being put. Among these are lime--making, manufacturing of calcium carbide, sulphite, pulp manufacturing, etc. The demand for brick and other clay goods has been active. The production of portland cement continues to grow. One or two new plants began operation during the year and others are approaching completion. The output of building materials in the Province, which in 1902 had a total value of $4,763,667, is this year likely to exceed that amount.

BRITISH COLUMBIA.

By S. S. FOWLER.

Gold and Silver.—The mining of gold and silver-bearing ores in British Columbia continues to be done chiefly in a very small part of the province, namely, the southeastern corner, comprising the district of Kootenay and a portion of Yale, all of it being south of the Canadian Pacific Railway.

The following table represents approximately the output of the year 1903:

	Ore, tons.	Gold. oz.	Silver, oz.	Copper, tons.	Lead, tons.
Boundary district.	684,000	48,000	247,000	8,245	.....
Rossland	406,200	164,700	467,000	4,525	.....
Nelson	84,000	24,300	207,000	195	550
Slocan and East Kootenay	22,100	3,400	2,375,000	.....	9,295
Miscellaneous ..	13,700	7,600	4,000	.....	.....
Total	1,210,000	248,000	3,300,000	12,965	9,845

As compared with the output of 1902 there is an increase of over 200,000 tons of ore, an increase of about 17,000 oz. gold, and a decrease of 600,000 oz. silver. The ultimate reasons explaining these changes are to be found under the headings 'Copper' and 'Lead.' It is to be noted, however, that the tonnage mined in the extremely low-grade district of the Boundary is 56.4 per cent of the total. The average ores of the Boundary are found to yield about .07 oz. gold, 0.35 oz. silver and 1.2 per cent copper. The precious metals are therefore less in value than the base.

A few small mines of this Boundary district, all in the vicinity of Greenwood, are producing quartz ores with about 4 to 5 oz. gold and 50 to 60 oz. silver per ton. Allowance for such material makes the profitable mining of the copper-bearing ores all the more remarkable.

In the Rossland district there has been a radical increase of tonnage and metal recovery. Here the main value is in gold, the ores averaging, as now mined, about 0.45 oz. gold, 1.1 oz. silver, and 1.1 per cent copper. Continuance of operation at the more important mines, therefore, indicates a greatly decreased cost of either mining or smelting, or both, as compared with that which prevailed only five or six years ago, when freight and smelting charges amounted to from $9 to $11 per ton.

The year 1903 has witnessed the apparently successful introduction of the Elmore process, and its success in concentrating the low-grade ores of the Le Roi No. 2 mine is leading to its application elsewhere.

The Rossland Water Power Company, affiliated with the Centre Star and War Eagle mines, is now building a large concentrating plant at Trail. The completion of this will undoubtedly lead to a much increased tonnage output in the coming year.

In the Nelson district, the old Silver King mine has been successfully operated in a small way under lease, whilst the milling of free gold ores and the mining of sulphide gold ores at the smaller properties has resulted in an increased tonnage and metal output from them as compared with 1902. The net output of gold is about the same as that of 1902, but that of silver has decreased considerably.

At various outlying camps several 10-stamp gold mills have been built, but they began operations too late in the year to have any marked effect on the output. Including these plants and the older ones, the free milling properties have crushed during 1903 about 95,000 tons of quartz, yielding in bullion 25,000 oz. gold and about 17,000 oz. silver.

Slocan, East Kootenay and the Lardeau are producers of the greater part of the silver and practically all of the lead of the province. This lead country has, for various reasons, been far from prosperous, with a consequent considerable decrease in the output of dry silver ores; the net result being that the silver output from these districts will be about 600,000 oz. less than in 1902.

In the Similkameen river country, on the eastern slopes of the Cascades, and near Hedley City, the Nickel Plate mine, belonging to the representatives of the late Marcus Daly, has about finished a 40-stamp mill with concentrating and cyanide plants. The ore is quartz carrying arsenical pyrite and, in gold tenor, is said to be much above the average milling ores of the country. This property may be looked to for a large output during the coming year.

Aside from the gold-milling center about Cambourne, in the upper Lardeau and Fish river, the only other district which has attracted much notice during the year is what is now known as Poplar. This camp is situated on the Lardeau river northwest of Kootenay lake, and, although it has not yet reached the stage of commercial production, it has caused much local excitement because of the extraordinary richness of the large quantity of specimens sent out. Development is being prosecuted on several of the more prominent claims, and the coming year doubtless will have added much to our knowledge of this district, which bears the promise of becoming important.

An interesting feature of progress during 1903 has been the construction of a 20-stamp chloridizing mill for the treatment of concentrator tailings from the ore of the Silver Cup mine in the Lardeau district. The outcome of this return to an old process will be watched keenly.

Another important undertaking is the preparation for work on an extensive scale of the Hunter V. property near Ymir, 20 miles south of Nelson. This mine carries a belt of limestone about 200 ft. wide, which at many points is impregnated with silver minerals to such an extent as to yield about 15 to 20 oz. silver per ton, with small amounts of gold. The rock itself has a large excess of lime and is thus desirable to the local smelters. A tramway of 25 miles length has been built to the Great Northern railway and shipments will begin early in 1904.

Copper.—The production of copper in southeastern British Columbia for 1903 has amounted to 12,965 tons (2,000 lb.), of which 8,245 tons is the result of smelting about 684,000 tons from the mines of the Boundary district near Phœnix and Greenwood, whilst about 4,525 was derived from 406,000 tons produced from the mines of Rossland and its vicinity.

Most of the Boundary ores are smelted at the three local plants of the Granby Company, the British Columbia Copper Company, and the Montreal & Boston Company, none of which are more than 25 miles from the mines. These three plants now have in operation ten large furnaces, whose joint daily capacity may be put at 3,000 tons. Concentration to matte proceeds in the ratio of about 40 tons into one, and the resulting matte averages about 45 per cent copper . All of the matte is converted to blister copper at the works of the Granby Company, at Grand Forks, and the products are shipped to New York for refining.

The British Columbia Copper Company is now

installing two stands of converters, and it is said to be preparing to double its smelting capacity. These works are being equipped for operation by electric power derived from the plant of the Cascade Water, Power & Light Company, at Cascade, on the Kettle river.

The essentially low grade character of these Boundary mines renders operations on a large scale necessary to success, and as the mines become further developed, the extensions of mining and smelting equipment seem certain of justification. The latest announcement of important development work is of that to be undertaken by the Granby Company; this involves the driving of a two-mile adit intended to tap the Phœnix mines at about 1,700 ft. depth. The company also contemplates the erection of another smelting plant near the mouth of this adit, with the ultimate object of doubling the present output.

Two or more properties in this district have been added to the list of shippers during the year, namely, the Oro Denoro and the Athelstane, but the supply of ores sufficiently high in sulphur still seems to be insufficient to permit other than the high ratio of ore to matte above mentioned.

In 1902 the Boundary produced about 520,000 tons of ore and 7,480 tons of copper. The development and advancement of this region is therefore evident. The Granby Company has been placed upon the dividend list.

At Rossland, beside an increase of tonnage, amounting to 75,000 tons as compared with 1902, an important and interesting phase of the progress of the district has been the successful application of the Elmore process to the concentration of the lower grade of ores. A 50-ton plant at the Le Roi No. 2 property was finished about the middle of September, and it is stated that its success has already resulted in arrangements for two other plants. Near the smelting town of Trail a concentration plant is being erected, essentially for the benefit of the Centre Star and War Eagle mines. The tailings will be re-treated by a process, the details of which have, I believe, not yet been made public, and also, in part, by the application of the Elmore process.

A CLIFF OF ORE ON HOWE SOUND, B. C.

About 60 per cent of the Rossland output is smelted at Northport, Wash., and the remainder chiefly at Trail, although latterly a small part has been sent to Greenwood, where the Rossland ore is desirable on account of its greater content of sulphur. The haul of 140 miles and the heavy grade of railway, however, prevent any great part of Rossland ores being smelted at points so far away. At Trail much of the low-grade Rossland ore has been smelted with lead ores.

The general reduction of costs at Rossland, with lower freight and treatment rates, has afforded this district an opportunity of regaining its former strength, and now that concentration has become an efficient factor there appears to be an excellent future for the town.

In 1902 Rossland and the Boundary produced about 92 per cent of all British Columbia copper. The balance came from the mines of Vancouver Island, for which the Tyee and Northwestern companies both built well-equipped smelting plants. I regret to say that I have not received figures of output for the year 1903.

B. C. COPPER COMPANY'S SMELTER, GREENWOOD, B. C.

No new copper districts have been discovered during 1903, but more or less quiet development is proceeding in the Similkameen, Nicola and Kamloops districts. Kamloops has shipped small quantities, and it is reported that arrangements are being made for the establishment of a smelting plant at that point. As far as development has proceeded in the Similkameen and Upper Nicola camps, the several important properties have proved to be remarkable, both on account of their size and high copper contents. This country is still waiting for the advent of the railway; when that takes place there will be greater stimulus to production.

Lead.—Until quite recently, and for two years past, the conditions surrounding the lead-silver mining industry in British Columbia have been distinctly unsatisfactory. The only available market within easy reach has been in the United States, but free access to it has been precluded by the tariff. The low prices obtainable by the miner for his lead (at present $1.40 per 100 lb.), and the low value of silver, brought the British Columbia lead mines a year ago to a point at which profits vanished and the industry was fast expiring; this was evidenced by a decrease from about 36,600 tons in 1900 to 11,000 tons in 1902. An appeal for assistance was made to the Dominion government last spring; a radical change in the Canadian tariff was asked; but instead of this, the miner had to be content with a bounty of $15 per ton for five years and limited to $500,000 in any one year, on ore mined and smelted in Canada. The decision was reached by the government in July last, and in December arrangements were finally perfected for the payment of any bounty earned.

Meantime, although silver prices became somewhat better than they were a year ago, the mines, for one reason or another, have not been very actively worked, and the result is that the year 1903 will show a total production of lead of not much over 9,800 tons. Some of this is practically a by-product and would have been produced at any price, from gold ores.

The production of lead-silver ores, as such, will

amount to about 22,100 tons, containing about 9,300 tons of lead and 2,375,000 oz. silver, all figures including a rather liberal allowance of output for December. These compare very unfavorably with the figures for 1902, when 31,700 tons of ore containing 10,400 tons of lead and 2,928,000 oz. silver were marketed. It is noticeable that the decrease of silver is very much greater, proportionately, than that of the lead. This is mainly because of the great falling off in the production of the dry silver ores from the Slocan Lake mines. The low prices of silver and a smaller demand for these ores consequent on the decreased production of lead, is responsible for this important change.

During the period of depression, which has lasted so long, some of the lead properties unfortunately, and possibly unavoidably, permitted development work to get very far behind, and it is now undoubtedly a fact that these properties are face to face with depleted treasuries and exhausted ore-reserves. Although this remark cannot be applied to more than a few of the mines, it is, still, a condition which, together with uncertainty as to when the lead-bounty was to be available, and some professed dissatisfaction as to smelting rates or attempts at having them lessened, has produced a very gloomy year in the lead districts.

Under such circumstances, mine-owners have naturally begun to think more of the possibility of deriving some revenue from the zinc contents of their mines, instead of longer permitting that metal to be a burden on their operations. Considerable interest in the zinc-producing capabilities of the Slocan has been manifest not only on the part of the owners, but, as well, on the part of zinc-ore buyers and the sellers of the various makes of magnetic separators. The net result of this interest in a comparatively new phase of the lead-mining business, is that about 2,000 tons of zinc ore or concentrates have been marketed, and at least one magnetic separating plant has been put into successful operation. Success in turning this hitherto baneful element to account certainly seems to be nearer, for the whole of the Slocan, than it was a few months ago. Most of the product of this class has gone to Iola, in Kansas, at a freight cost of $11 per ton. This charge is greater than the product can well stand, and the feeling is growing that ultimate success is to be reached only by the means of a reduction plant erected in the country, or else a very moderate freight rate to tidewater.

It is interesting to note that, as the result of zinc-milling, in some instances at least, the higher the grade of zinc in the concentrate the lower the silver values become. This is of importance because of the fact that in the earlier zinc shipments, containing from 40 to 45 per cent, the silver was sold at far too great a sacrifice. Effort toward as perfect a concentration as possible is to be made, therefore, and it is satisfactory to note that at the mill of the Payne mine a product of 55 per cent is now being made, with only a very low silver content. The silver minerals are supposed to accompany the magnetic tailings, which may be found to command a ready sale to the lead smelter.

At the close of the year there is found a decidedly better feeling in the lead camps, and it may be expected that, what with artificial assistance of the lead-bounty, the better utilization of the ores, the new 'finds' and any improvement in the prices of silver, 1904 will witness a return of former prosperity.

Excepting about 2,900 tons, all of the product of the lead mines was sold either to the Hall Mining & Smelting Company, at Nelson, or to the Canadian Smelting Works at Trail. At the latter point a new electrolytic lead-refining plant of 20 tons daily capacity was erected during the year.

Schist is from the Greek, *schistos,* cloven. Shale is also Greek, from *schale,* meaning shell. Gneiss is German. Slate is modified from slat, a thin strip, and comes from Old French *esclat,* a splinter or chip.

THE TRANSVAAL.

By W. Fischer Wilkinson.

In reviewing the events of the year 1902, I was able to say that the gold mining industry had made steady progress toward regaining the important position that it held before the war, and although the maximum figures of 1898 have not yet been reached, a steady expansion can again be recorded. The value of the gold produced during 1903 will be about £12,600,000, as against £7,253,665, which was the value of the production during 1902.

That a more rapid expansion has not taken place is due entirely to the scarcity of native labor, as will be explained in detail later in this review. Meanwhile I give tables showing the monthly output for 1903 and the annual production since 1884. These tables are compiled from the statistics of the Chamber of Mines and are put in a more condensed form than last year. The December figures are estimated.

Table A.—Transvaal Gold Production for 1903.

	Witwatersrand Mines.					
1903.	No. of Co.'s.	Tons milled.	No. of stamps.	Fine gold, oz.	Value.	Outside mines.	All Transvaal.
January	43	405,904	2,905	192,935	£819,535	£26,954	£846,489
February	44	388,440	2,975	187,978	798,480	36,259	834,739
March	47	437,705	3,120	208,457	885,467	38,272	923,739
April	47	450,490	3,285	218,900	929,830	38,106	967,936
May	47	471,476	3,380	224,410	953,231	41,274	994,505
June	49	496,960	3,523	288,168	969,194	43,128	1,012,322
July	52	523,897	3,725	242,071	1,028,250	40,667	1,068,917
August	55	570,647	4,047	262,570	1,115,325	39,714	1,155,039
September	53	573,316	4,135	267,513	1,136,325	36,886	1,173,211
October	53	598,077	4,275	275,664	1,170,946	37,723	1,208,669
November	..	579,000	.....	272,107	1,155,836	32,735	1,188,571
December	..	591,000	.....	277,800	1,180,000	35,000	1,215,000
Totals	..	6,086,912	.....	2,918,573	£12,142,419	£446,718	£12,589,137

Table B.—Gold Production of the Transvaal.

	Witwatersrand District.					
Date.	Tons milled.	Value, £.	Value per ton milled, shillings.	Outside mines, £.	All Transvaal. £.
1884-89...	1,000,000	2,440,000	48.8	238,231	2,678,231
1890	730,350	1,735,491	47.4	134,154	1,869,645
1891	1,154,144	2,556,328	44.2	367,977	2,924,305
1892	1,979,354	4,297,610	43.4	243,461	4,541,071
1893	2,203,704	5,187,206	47.0	293,292	5,480,498
1894	2,830,885	6,963,100	49.2	704,052	7,667,152
1895	3,456,575	7,840,779	45.2	728,776	8,569,555
1896	4,011,697	7,864,341	39.2	739,480	8,603,821
1897	5,325,355	10,583,616	39.74	1,070,109	11,653,725
1898	7,331,446	15,141,376	41.3	1,099,254	16,240,630
1899 (a).	6,639,355	14,046,686	41.15	661,220	15,728,693
1899 (b).	233,395(c)	1,020,787	....	.....	1,510,131
1900	459,018	1,510,131	65.82	81,364	1,096,051
1901	412,006	1,014,687	49.25	74,592	7,253,665
1902	3,416,813	7,179,073	42.02	446,718	12,589,137
1903 (d).	6,086,912	12,142,419	39.88		

(a) January to October.
(b) November to December and supplementary.
(c) Incomplete.
(d) Returns for December are estimated.

The returns for 1903 are far below the producing capacity of the equipped mines, nearly all of which have some stamps standing idle, owing to the insufficient supply of labor. The position that the industry had reached in October, 1903, was equivalent roughly to 72 per cent of the results obtained in August, 1899, just before the war.

Witwatersrand Returns.

	August, 1899.	October, 1903.	Ratio, per cent.
Stamps running	5,970	4,275	71.6
Tons milled	812,469	598,077	73.6
Value of yield.....	1,642,025	1,170,946	71.3

In July, 1903, the number of stamps erected was 7,145, of which 3,725 were running and 3,420 were idle. The earning capacity of the idle stamps, according to Mr. H. H. Webb, was £11,000,000 which would have given employment to 5,600 skilled white men, whose wages would have been £2,000,000 and dividends amounting to £3,000,000 would have been earned. These figures show the gravity of the labor problem in the Transvaal, about which so much has been said and written during the year.

The economic position of the Transvaal has been subject to very detailed scrutiny during 1903, and a large amount of statistical information has been collected, to summarize which in the space allotted to me is a formidable task.

Among the most important reports published is the descriptive and statistical statement of the gold mining industry of the Transvaal, annexure to the Thirteenth Report of the Transvaal Chamber of Mines for the Year 1902, which was prepared by a committee of the leading engineers on the Rand for the use of Mr. Chamberlain on the occasion of his official visit, as Secretary of State for the Colonies, to South Africa in the early part of the year.

This exhaustive report was accompanied by tables and maps, and is a mine of up-to-date information concerning the position and prospects of the mining industry. An extract of some of the statistics will be given below.

It is shown that 120 companies had, on December 31, 1902, an issued capital of £53,075,330, with a market valuation of £173,126,414, and that 71 companies had erected 6,560 stamps. One hundred and eleven companies had incurred a capital expenditure, on development and equipment of not less than £36,919,650, and 47 companies had paid dividends aggregating £19,477,907, so that, apart from the cost or purchase of mining property, some £17,441,743 had been spent in excess of the amount received back in dividends.

The average capital expenditure on development and equipment on 6,325 stamps has been £4,811 per stamp. The projected expenditure in connection with deep-level mines for the next ten years, is about £50,000,000.

Further statistics of interest prove that the cost of working during 1902 was estimated at 2s. 10d. per ton more than 1898, or 3s. 4d. including the present government tax on profits; that the population south of the Zambesi is, whites, 1,000,000; natives, 5,000,000; total, 6,000,000; and that the labor employed on the mines in 1899 was: Kaffirs, 100,000; whites, 12,000; the ratio of white labor to black being in 1898 as 1 to 7, and in 1902 as 1 to 5.

Another report of great interest to the gold mining community was that prepared by Mr. H. Ross Skinner on behalf of the Witwatersrand Native Labor Association on the subject of Asiatic labor, which was published in November. Mr. Skinner visited China and countries where the Chinese had been employed in mines and formed a favorable opinion as to their suitability for labor in the mines, and as to the possibility of obtaining a sufficient supply.

The government of the Transvaal made their own inquiry into the labor question and appointed a commission to investigate the subject. This commission has recently issued its report, and as the members of the commission were not unanimous, majority and minority reports were issued.

The findings of the majority report according to the telegraphic summary of the *Times'* correspondent at Johannesburg, were as follows:

"First, the demand for native labor for agriculture in the Transvaal is largely in excess of the present supply, and as the development of the country proceeds this demand will greatly increase.

"Secondly, the demand for native labor in the Transvaal for the mining industry is in excess of the present supply by about 129,000 laborers, and, while no complete data as to the future requirements of the whole industry are obtainable, it is estimated that the mines on the Witwatersrand alone will require within the next five years an additional supply of 196,000 laborers.

"Thirdly, the demand for native labor for other Transvaal industries, including railways, is greatly in excess of the present supply, and will increase concurrently with the advancement of mining and agriculture.

"Fourthly, there is no adequate supply of labor in central or southern Africa to meet the above requirements."

The commission states that the native labor requirements at present are as follows:

For mining purposes	129,364
For agriculture	80,000
For railways	40,000
Total	249,364

It is estimated that within five years the number required will be 650,574. The commission also states that the evidence of the past is overwhelmingly and conclusively against the contention that white labor can successfully compete with black in the lower fields of manual labor.

With reference to the minority report the chief interest attaches to the support given to the opinion of Mr. Cresswell, the late manager of the Village Main Reef mine, who has been a warm advocate of the employment of unskilled white labor, but whose experiments in this direction at the Village Main Reef mine have been adversely criticized by other engineers.

STEEL HEAD-GEAR, ROBINSON DEEP MINE.

The question as to how far unskilled white labor could be economically employed on the Rand was very carefully gone into by the committee of engineers who signed the Chamberlain report already referred to, and it was estimated that assuming a white unskilled laborer at 12s. per day equals in efficiency two kaffirs at 2s. 4d. per day with food each, the average cost of production would be increased 10s. 1d. per ton and the result would be that out of 79 mining companies, 48 would be losing concerns, 19 would barely clear expenses, and only 12 would give satisfactory returns. Under these conditions only the richest reefs would be workable and the low-grade ores which occur so abundantly, and on which the permanent prosperity of the Transvaal depends, would remain undeveloped.

Although recruiting for native labor has been prosecuted with vigor during the past year, the results have been very disappointing. The number of natives employed on the mines at the end of January was 49,506, and this number was only increased to 68,958 by the end of October. This small increase only goes a very small way toward meeting the demands of the mines, and it is evident that to insure rapid progress Asiatics must be imported.

Chinese and Indian labor have both been proposed and, subject to the consent of the legislative council of the Transvaal and of the Imperial government at home, one or other, if not both of these sources of supply are likely to be drawn from in the near future.

So far it has been Chinese labor that has been most prominently advocated. There are, however, many who would like to see India made the recruiting ground, being part of the British dominion and considerably more accessible than China. But attempts to obtain this labor have been opposed by the Indian government, on the ground, it is said, that the Indians in the Transvaal have been refused municipal rights. Whatever justice there may be in the complaint that the better classes of the Indian subjects now in South Africa are unfairly treated, it cannot be a sufficient reason for preventing the uneducated laboring classes from obtaining profitable employment in South Africa. Moreover the introduction of Indian subjects into South Africa would be no new departure, for they already exist there in large numbers, no fewer than 72,965 being in Natal alone. No difficulty was met with in importing Indian labor to build the Uganda railway and it seems illogical that opposition should be raised to their introduction into the Transvaal.

Although the labor question has occupied the largest share of public attention during the past year, a good deal of other useful work of benefit to the mining industry has been carried out. The water commission has been investigating the water supply of Johannesburg and of the mines. The health and well-being of the miners has been studied by two other commissions, namely, the Housing Commission and the Miners' Phthisis Commission, and much valuable information on these subjects has been obtained. The Transvaal government can be congratulated on having spared no effort to have every matter of public interest thoroughly ventilated before legislation.

Another important inquiry carried out during the year was that by Mr. Henry Birchenough who went out to report on the present position and future prospects of British trade in South Africa. An interesting blue book of 160 pages was the result of his investigation. The report takes a very optimistic view of the future of the Transvaal and anticipates an enormous increase in the future in the trade between Great Britain and her colonies. Although foreign competition is very active, America and Germany being the most formidable competitors, no less than 75 to 80 per cent of the imports into South Africa come from Great Britain or from British possessions.

Turning now to the working of the mines, it is satisfactory to be able to record an increased efficiency in many directions. Particularly is this noticeable in the employment of native labor, influenced by the extension of the contract system and by the stricter administration of the liquor law.

A reduction has been made in many cases in the ante-bellum working costs, which is all the more satisfactory, taking into consideration the fact that the mines are not working at their maximum capacity or under the most favorable conditions.

One great drawback to the economical working of the mines has been the necessity, arising from the shortage of labor, of an excessive use of rock-drills which, when a narrow reef is being worked, break a larger amount of waste rock than is the case when the drilling is done by hand. A noticeable reduction in the cost of mining comes under the head of explosives. To take one example, at the Henry Nourse mine the expense of explosives per ton crushed, in 1899, was 3s. 5.5d., while in 1903 the cost was reduced to 2s. 8.3d., a reduction of 22 per cent. Reduced railway rates also account for a considerable saving in the coal bill. As regards native labor, the cost to this company in 1899 was 59s. 1d. per month, including wages, housing, food, etc., while in 1903 this figure was 74s. 3d. or an increase of 25.6 per cent. The native is now better cared for than he has ever been before. As evidence of the attention that has been given to this subject, the following figures, compiled from statistics of ten companies under the control of the Consolidated Gold Fields of South Africa, show that the cost of food, hospital, etc., per native per month has increased nearly 50 per cent as compared to 1899.

July 1, 1902, to June 30, 1902	22s. 6d.
June 1, 1898, to May 1, 1899	15s. 1d.
Increase	7s. 5d.

The use of mechanical appliances has been extended wherever possible, especially on the surface where belt-conveyors are now largely used in the transport of ore and tailings. Machines are also being introduced for emptying and filling cyanide vats.

A considerable amount of prospecting work has been done during the past year, more especially in the Heidelberg district, and the area over which mining can be carried on is being extended.

The most important results obtained have been, however, on the western Rand, where systematic

drilling with the object of picking up the Randfontein series has succeeded in securing information which, though not quite definite, goes a long way toward solving the problems as regards the extension of the main reef series in the western Transvaal, a matter which has long puzzled local geologists.

The following (Table C) is a list of dividends declared during the year. Another table (D) showing the amounts paid in dividends since 1896 is also added:

TABLE C.—WITWATERSRAND MINES, DIVIDENDS DECLARED IN 1903 (INCOMPLETE).

Name of company.	Issued capital.	Per cent.	Amount.
Angelo	275,000	50	137,500
Bonanza	200,000	100	200,000
Crown Reef	120,000	155	186,000
Crown Deep	300,000	50	150,000
City and Suburban	1,360,000	15	204,000
Durban Roodepoort	125,000	75	93,750
Driefontein	275,000	40	110,000
Ferreira Deep	910,000	10	91,000
Ferreira	90,000	187½	168,750
Geldenhuis Estate	200,000	60	120,000
Geldenhuis Deep	300,000	45	135,000
Ginsberg	175,000	10	17,500
Henry Nourse	125,000	100	125,000
Jubilee	50,000	25	12,500
Laanglaagte Estate	470,000	20	94,000
Lancaster West	195,000	10	19,500
May Consolidated	288,750	32½	93,843
Meyer & Charlton	100,000	40	40,000
New Primrose	325,000	15	48,750
Nigel	223,106	5	11,155
Rietfontein "A"	317,500	10	31,750
Rose Deep	425,000	22½	95,625
Robinson	2,750,000	11	302,500
Robinson Deep	950,000	25	237,500
Roodepoort U. M. R.	295,000	15	44,250
Simmer & Jack	3,000,000	5	150,000
Treasury	540,000	13¾	74,250
Village Main Reef	400,000	20	80,000
Wemmer	80,000	100	80,000
			£3,352,373

This is not complete, as some mines do not declare their dividends until quite late in the year. I estimate the total amount for the year will be £3,900,000.

TABLE D.—DIVIDEND LIST, RAND GOLD MINING COMPANIES.

Year.	Number of companies.	Amount paid.
1896	21	£1,530,381
1897	25	2,707,180
1898	41	4,847,505
1899	36	2,933,251
1900	..	.....
1901	5	415,813
1902	23	2,148,715
1903	31	3,900,000

These results, earned from a comparatively small part of the mining area, indicate the enormous possibilities of the Transvaal gold-fields. Granted a plentiful supply of cheap labor, a rapid expansion of the gold mining industry may be confidently predicted. Without cheap labor mining must necessarily be confined to the richer ores, and the large quantities of low-grade ores will remain undeveloped. The situation has been so well summed up by Mr. H. H. Webb in his recent presidential address to the South African Association of Engineers that I will quote his words:

"If local conditions such as transport, labor, living, etc., can be made to favor them, the future possibilities of these fields are very great, not only for the investor but for the working man himself and the community depending on the mining industry, which means, more or less, the whole of South Africa. The Witwatersrand is not a poor man's mining district. The mines as a whole are low-grade, requiring large capital for development and equipment, and their future expansion and success depends largely on capital and cheap unskilled labor to work the large bodies of low-grade ores and deep-level holdings yet untouched. Deprived of either capital or unskilled labor they cannot be attacked, and the future prosperity of the whole of South Africa will be affected, for as we know, this country has not developed into an agricultural or manufacturing one, and the advancement of these depends directly on the prosperity of the mines."

The miners, by evident confusion, often call the dark, flinty veinstone 'hornblende,' instead of 'hornstone,' and in the same manner they convert 'vughole' into 'bug-hole.' Hornstone is good Anglo-Saxon, horn meaning resembling horn in being callous or hard, as in "horny-handed son of toil." The word 'chert' is nearly a mineralogical equivalent for hornstone. Chert is Irish, and originally meant pebble.

MINING IN WESTERN AUSTRALIA.

BY A. G. CHARLETON.

Gold mining in Western Australia in 1903 presents a record of steady progress, as evidenced by increased yield and dividends, additions to treatment plant, and lower working costs; moreover, some important deep-level developments and discoveries have been made, and the industry has reaped the benefit of the efforts made by the Chamber of Mines for the improvement of the laws and regulations relating to mining.

Production.—The production of gold from 1886 to June 30, 1903, comprising both the gold entered for export and that received at the Perth branch of the Royal Mint, has amounted to 10,196,222 oz. of bullion, representing 9,903,795 fine oz., valued at £42,068,645.

The product for the past three years has been:

	Bullion, oz.	Fine gold, oz.	Value.	
1900	1,580,950	1,414,311	£6,007,610	$29,236,034.06
1901	1,879,390	1,703,416	7,235,652	35,212,300.46
1902	2,177,442	1,871,038	7,947,663	38,677,301.99

The monthly production during 1903 is shown below; the figures from January to August, inclusive, are those given in the government official returns, while those from September to November are based upon advices received by the Agent General in London; December is estimated.

	Gold, oz.	Value.	
January	210,451	£757,624	$3,636,595.20
February	192,397	692,629	3,324,619.20
March	194,724	701,006	3,364,828.80
April	208,627	751,057	3,605,073.60
May	207,501	747,004	3,585,619.20
June	208,059	749,012	3,595,257.60
July	212,501	*765,004	3,672,019.20
August	206,617	743,821	3,570,340.80
September	201,405	725,058	3,480,278.40
October	190,785	686,824	3,296,755.20
November	201,174	724,224	3,476,275.20
December	207,000	745,200	3,576,960.00
Totals	2,441,241	£8,788,463	$42,184,622.40

*To July 31 the total is given as £5,163,336.

The dividends paid by Western Australian gold mining companies up to August 21, 1903, are officially given as follows:

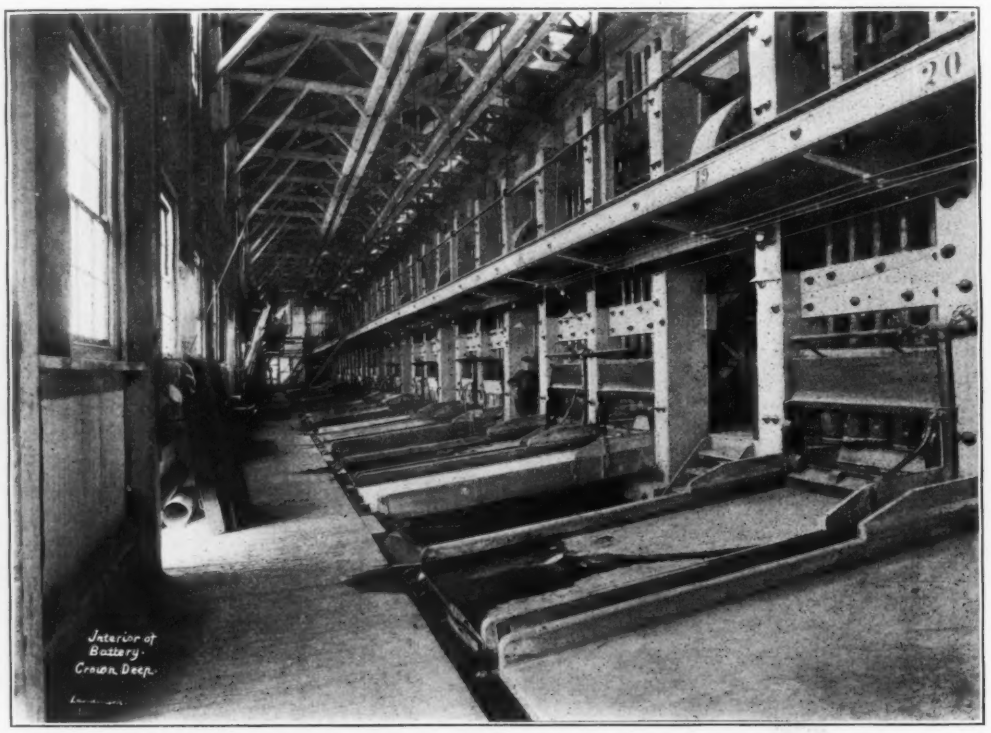
1890	£1,250	1897	£507,732
1891	5,326	1898	606,124
1892	1,875	1899	2,057,421
1893	34,350	1900	1,392,866
1894	110,642	1901	1,093,605
1895	82,183	1902	1,424,272
1896	168,216	1903 (for 9 months)	1,424,260

Since September 30, I estimate that about £356,812 has been paid in dividends by various London companies, which brings the total paid in eleven months up to £1,781,072, exclusive of dividends that may have been paid by local companies in Western Australia.

From 1896 up to June, 1903, some 8,562,015 tons of ore have been mined and treated, and the bullion yield per ton has been remarkably constant, as well as exceedingly high; averaging 1.5 oz. in 1897; 1.28 oz. in 1898; 1.31 oz. in 1899; 1.14 oz. in 1900; 1.15 oz. in 1901; 1.1 oz. in 1902; and from 1.06 oz. to 1.17 oz. from January to June, inclusive, 1903; which, considering the quantity of ore treated, may be considered phenomenal. In certain districts the average of the ore is much higher than these averages, but in such cases the tonnage is small.

The value of the gold bullion of the State was officially estimated in 1900 at £3 16s.; in 1901 at £3 17s.; in 1902 at £3 13s., and up to July, 1903, at £3 12s. per oz. The average fineness of Western Australian gold bullion in 1902 was established at .8432.

The excessive cost of living, due to heavy freight rates, storekeepers' profits, and other causes, no doubt justifies the high rates of wages; but it is fortunate that nature has endowed the State with exceptionally rich ores, otherwise the scope of employment in gold mining would be more limited than it is, and there can be no doubt that with lower wages and cheaper freight rates, many low-grade mines, which cannot at present be made to pay, would be worked at a profit, to the advantage of the industry as a whole, by bringing more capital into the country and extending the field of employment.



A WITWATERSRAND STAMP MILL—CROWN DEEP.

The report of the Chamber of Mines of Western Australia, May, 1903, gives an interesting comparative statement of current wages paid in different districts, as fixed by the Court of Arbitration of Western Australia; rates of wages previously paid; the hours of labor worked; the overtime rates to be paid; and the prices of food stuffs. This instructive table shows in many instances a considerable rise in the rates formerly obtaining; but, owing to the reasons just given, it is open to question whether this will tend to the advantage either of the mine operatives as a whole or of the industries of the State, as it must tend to check rapid development by restricting the profits of the capitalist, who can invest his capital to better advantage elsewhere, than in working propositions rendered unpayable by high local costs.

The following rates of wages obtain at Southern Cross, where they are lower than on any of the other fields: Rock-drill men, 11s. 8d.; assistants, 19s.; miners and timbermen, 10s.; bracemen, platmen and

mullockers, 9s.; engine-drivers and tool-smiths, 12s., and laborers 9s. per day.

At Kalgoorlie, machine-men in "dry ground" are now paid 14s. 4d.; rising in dry ground, 13s. 10d., driving, cross-cutting, stoping or winzing in dry ground, 13s. 4d.; rock-drill assistants, brace and platmen get 11s. 8d.; mullockers and shovelers or truckers shoveling, 10s. 6d.; trucking from shoots, 10s.; timbermen, 13s. 4d.; engine-drivers, 13s. 4d.; surface laborers at cyanide vats, 11s. 8d.; other laborers, 10s. On most of the other fields the rates are considerably higher.

Gold is very widely distributed over the State, about 332,773 sq. miles being proclaimed as auriferous, but a large portion of this area has scarcely been prospected as yet, and so much of it is covered with alluvium and ironstone gravel that a chance accident may at any time lead to a rich find and the opening up of a new gold-field, as was the case with Kalgoorlie. Only about 2,000 sq. miles, held at various times under lease, can be said to have been carefully examined and prospected. Kalgoorlie produced about 52.83 per cent of the total gold output of the State in 1902, but only possessed, I believe, 7 per cent of the total number of properties making returns. The largest number of producing mines possessed by any one district is 9 per cent; consequently it is not a one-camp mining country, as it is frequently assumed to be.

Some 2,424 leases were held in 1902, notwithstanding the onerous labor conditions and rent, one man being required by law to be employed for every six acres, while the government rental is £1 per acre. If, however, it be assumed that each lease averages 20 acres, this, without allowing for "exemptions," would only give assured employment to about 8,080 men, if work were simply limited to the requirements of law. These labor requirements press most hardly in cases where a large sum has been expended on a property without finding payable ore, but where ore exists which might in course of a few years be worked at a profit, with cheaper communication and under improved local conditions.

The mines of Western Australia, as Mr. H. C. Hoover has observed, may be divided into four groups:

1. Leases and prospects absolutely without equipment, and of uncertain value. Many mines of this class are producing some gold by custom milling, and they contribute at present about 11 per cent to the output of the State. "A total of 1,220 of such properties produced ore in 1902, and fully 1,800 were being actually worked."

2. Small mines possessing mining equipment, which are more or less regular producers, but whose future is entirely prospective. "Of these there are 85 now contributing 11 per cent of the total output of the State."

3. Mines of medium size producing ore regularly at a profit, or in course of development, preparing for advancement to the 4th group. "There are 13 mines of this class now contributing 12 per cent to the total output of the State."

4. Large proved properties demonstrated to be sound mining concerns ranking among the large gold mines of the world. "Of this group there are 16 which are now (1903) producing 63 per cent of the total product of the State,"[1] and they may be credited with 62 per cent of the total gold production of Western Australia in 1902. This group treats about 100,000 tons per month, and in the near future will, I believe, be able to deal with some 112,000 tons monthly; their production having gradually risen from about 41 per cent of the total output of the State in 1898.

In the middle of 1903 they produced about 123,000 oz. of bullion, representing 104,153 oz. of fine gold per month, valued at £442,000.

In 1902 these 16 mines paid £1,330,327 in dividends, or 93 per cent of the total paid by the public gold mining companies of Western Australia, but this represented only a portion of their profits, as very large amounts (upwards of £1,750,000) have been spent on equipment and development since the commencement of operations, and so deducted from their profits. When the plants in course of erection are running, Mr. Hoover anticipates that the dividends of the group will reach over £2,100,000 per annum, and he presents some very interesting calculations with a view to showing their average value per foot of depth. Adding the total output to the reserves, he reckons that above an average depth of 826 ft. there is and has been 6,223,030 tons of ore containing 7,757,037 oz. of fine gold, of a value of £32,780,399, and these mines are only at present exhausted to an average depth of less than 425 ft.

Figuring upon the sulphide ore, he concludes that each foot in depth represents, on the average, 7,100 tons[2] containing 8,270 oz. of fine gold, valued at close upon £35,000, representing, roughly, £23,000 profit per foot in depth. This figure of profit appears, however, to be based on what I should regard as a low average to take as representative of present working costs; calculated upon this basis, I should not be disposed to look for a larger profit than £14,613 per foot in depth; but as working costs are constantly being reduced by increased economies, the actual figure probably lies between these two extremes.

Treating 112,000 tons per month, Mr. Hoover figures that 177 ft. of depth will be exhausted per annum. An average of 400 ft. in depth of development per annum would, therefore, suffice to open up sufficient reserves to warrant doubling their present output, which Mr. Hoover estimates should raise the gold production of these mines to over 2,000,000 oz. annually; such an output he reckons would only exhaust them to 4,000 ft. in depth in 13 years. It is possible, however, that an increased output may lower the grade of the ore, as has so often happened in other cases, unless a very large amount of ground is blocked out in advance; and it may be the best policy to do so.

Speaking generally in regard to this group, the probabilities are in favor of their permanency to a great depth; and developments show that down to 1,700 ft. from surface, the value and amount of ore developed is fully equal to that in the sulphide zone already stoped out.

It has been estimated that the 16 mines referred to produced 62 per cent of the gold output of Western Australia in 1902; and it is noteworthy that, while they paid £1,330,327 in dividends, the remaining 1,317 mines, producing about 35 per cent of the gold output, only paid £93,945.

It would appear, therefore, that the working-costs of the principal group are very much lower, as might be anticipated, than those of the other three groups, because they are working on a much larger scale, and Mr. Hoover apparently figures their costs at an average of about £1 14s. per ton, in making the calculations previously given, or between 8 and 9 dwt. of fine gold; while he states that "the possibility of at present working 7 dwt. ores" has been demonstrated, that is, in the case of the free milling ores, like the Great Fingall. This has doubtless been largely brought about by improved management, resulting in the adoption of labor-saving appliances and other economies.

As regards mining at Kalgoorlie, the chief features of the year 1903 on the western side of the field have been: (1) The improvement in the position and prospects of the Associated Gold Mines; (2) The developments in the Oroya Brownhill, in following the remarkable chimney which has continued, from its outcrop in the Brownhill, through the Associated Northern Blocks and across the Oroya (North) lease almost to its southern boundary, and which is estimated by Mr. H. Daly to be worth £1,491 per foot in length, or £9 3s. 11d. per ton, while the addition to ore-reserves and increased output of the Kargurli may also be noticed in this section of the field. (3) In the center of the "golden mile," the yield of the Perseverance, which reached as high a monthly total as 17,940.82 oz. in August last, with an average of 2.62 oz. of bullion per ton, and the improved position of the Lake View, are satisfactory features in the general progress of the field. (4) On the east side of the Boulder area the proving of the lode in the Great Boulder Proprietary by a bore-hole at a depth of 1,750 ft., 27 ft. west of the shaft. (5) The recent discovery of the lode in the Ivanhoe South Extended, by diamond drilling, at a depth of 1,920 ft. vertical, showing 4 ft. of ore assaying 1 oz. 15 dwt. per ton, is an event of importance; and (6) the developments in the Ivanhoe and Golden Horseshoe, which have proved the existence of very large reserves of ore, and the large output of the Golden Horseshoe, which averaged about 17,590 oz. per month in July, August and September (the average grade of the ore being 1.38 oz. per ton) call for remark. (7) In the outside districts, the Ida H. N. Laverton has lately come into notice as a producer, and the large reserves with which the Great Fingall is credited, and its low working-costs, are matters for congratulation and comment.

The Ivanhoe in 1902, I believe, held the record for low working-costs on the Kalgoorlie field, at £2 1s. 4.58d. per ton; and, when the present additions and alterations to the plant are in operation, it is expected that the total costs, inclusive of London management, will not exceed 35s., and with the present

SHAFT NO. 3, NEW MT. MORGAN, WESTERN AUSTRALIA.

[1] Three per cent of the total output comes from alluvial and specimen gold.

[2] If the oxidized ore was included with the sulphide ore, the average would be higher, and Mr. Hoover estimates it at 7,534 tons per foot of depth, containing 9,391 oz. of fine gold, valued at £39,688; but this is due partly to "superficial enrichment" and partly to the greater width of the ore-bodies in the oxidized zone, which extends to a depth of 150 to 300 ft. from surface.

grade of ore a profit of £2 per ton should be realized. In this connection, as working-costs become lower, it should appear good policy for some of the higher-grade mines to enlarge their plant and output, and correspondingly reduce the average grade of the ore treated.

Ore Treatment.—The new Merton furnaces have given great satisfaction at the Great Boulder, where I had an opportunity of seeing them in operation, and are being largely introduced at other mines. They seem to have solved the difficulty of roasting the Kalgoorlie tellurides properly at a cheap rate.

The system of agitating slimes at the Kalgoorlie mines and circulating the solution for vat-leaching is most interesting and novel, and great perfection has been reached in disposing of worthless tailings by means of Robins belt-conveyors and "flying foxes," as well as in the conveyance of ore in the mills by means of "grasshopper conveyors." The relative advantages of the Diehl and roasting processes are still a subject of discussion, and they run each other very close. The Great Boulder Perseverance and Great Boulder roasting treatment is estimated to have cost about 21s. in 1902-1903, while the cost of the Diehl process at Lake View Consols was reduced this year to about 17s. 10d.; the figure at which, I believe, it now stands. But I am informed that the Great Boulder Proprietary has also brought down costs, and that they amounted to only 16s. 9d. in August last.

The extraction by both methods varies within the limits of 92 to 96 per cent; which is exceedingly good.

Great credit is due to the Chamber of Mines, which is under the Presidency of Mr. Richard Hamilton, for the active part it has taken in urging improvements on the government and public bodies in many directions; by endeavoring to promote legislation, and by taking action on various questions of importance, including the Esperance Bay railway, the amendment of the mining law, railway rates, etc. The Chamber has also done much to encourage discussion on topics of interest to the industry, such as the relative efficiency of various types of condensers, uniform cost-keeping and gold records; all this has tended to improve the status of the industry, to reduce mining expenses for the benefit of the capitalist, and to promote the safety and welfare of the working miner.

In conclusion, I may add that one of the great events of the year has been the completion of the government "water scheme," and the delivery of a large supply of fresh water to the mines of Kalgoorlie. A complete geological map of the Kalgoorlie field has also been published by the Geological Survey of Western Australia, and the government has founded a State School of Mines at Kalgoorlie.

Political organization and the exigencies of reform demand that government, in whatever form it exists, should partake of a more or less partisan character; but I think the government of Western Australia is becoming more alive to the fact that legislation in the exclusive interest of any particular section of the community is always a mistake.

SEPARATION OF COBALT AND NICKEL ELECTROLYTICALLY.—Experiments in the anodic decomposition of nickel and cobalt solutions show that the two metals can be separated by electrolysis (*Zeitschrift für Angewandte Chemie*, Vol. XXXIII, p. 9). The conductivity of the solutions must be increased by the addition of potassium sulphate. A platinum cathode is used, and potassium bichromate is added to act as a depolarizing agent. The electrolysis must be carried out in a hot solution and with a current of about 2.3 volts and from 0.10 to 0.15 ampere. This method is very useful for the detection of small quantities of cobalt in the presence of nickel, the cobalt quickly forming a dark deposit on the platinum anode.

METALLURGICAL PROGRESS IN WESTERN AUSTRALIA.

By ALFRED JAMES.

It is no small matter for a gold-field to be able to claim to have reduced its treatment cost by 25 per cent in one year; but at Kalgoorlie the managers of the leading properties are not only in a position to make such a claim but to substantiate it fully.

While the completion of the fresh-water scheme has notably aided the management in their efforts, so brilliant a result is undoubtedly due to the high technical skill and intelligently directed energy which has been brought to bear on the problem, and also to the keen but good-natured rivalry between the "all-roasting" and "combination" processes, which has done not a little towards the achievement of such creditable work.

Last year, in stating the treatment costs of some of the best managed mines, it was shown that the Great Boulder Main Reef, with an average treatment cost of 25s. a ton, had been able to lower it in its best month to 21s. per ton, and in this it was closely approached by the Hannan's Star company. On richer ores such as those of the Hannan's Brownhill and Lake View Consols, the costs were no less than 32s. 9d. for treatment, of which bromo-cyanide alone accounts for as much as 8s. per ton.

The first two of the above companies have now, however, reduced their treatment costs to under 16s. per ton, and it is most interesting to note that these two companies are neighbors, have mills of nearly the same size—the Hannan's Star putting through perhaps 25 per cent more ore than the Great Boulder Main Reef, and thus having the advantage of distributing its costs over a greater quantity of ore—and in spite of their comparatively small output they usually manage to show the lowest treatment costs on the field, each being the pioneer of the roasting and bromo-cyanide practice, respectively.

For October, the Great Boulder Main Reef held indisputably premier position; for November, Hannan's Star has been able to reduce its costs to under 16s. per ton, and thus to nearly get even with the Great Boulder Main Reef figure for the previous month.

But such mines as the Great Boulder Proprietary, the Lake View and the Oroya Brownhill, are in no way behindhand in also accomplishing considerable reductions, although their costs may not be as low as those of the two companies referred to. The Lake View costs for July, 1902, were 25s.; they have now been reduced to 17s. (per long ton). The Great Boulder Proprietary costs in 1902 were 23s.; as late as May, 1903, they were 19s. 6d.; they are now 17s.

It may be asserted that these expenses are still high compared with treatment-costs in other regions, but it must be remembered that the Kalgoorlie charges are for the treatment of a complicated and difficult sulpho-telluride ore, which it has now been practically universally admitted must be roasted—at least in part—as well as receive other special treatment.

That the engineers in charge are not one whit behind the rest of the world in their effort to secure economy is shown by the Great Fingall mine, which is directed by the same engineering firm as controls the Great Boulder Main Reef and the Lake View companies; the total expenses at the Great Fingall are only 20s. per ton for mining, management and ore treatment complete, the latter item being only one-half of the lowest costs at Kalgoorlie.

Before leaving the subject of costs, it will be proper to give details; these are as follows:

	Per ton.	
Crushing	6d.	
Milling	2s. 6d. to 3s. 9d.	
Roasting	3s. od.	(Merton)
Roasting	4s. od.	(Edwards)
Amalgamation and grinding	1s. 6d. to 2s. 6d.	
Agitation and cyaniding	2s. 6d. to 7s. 6d.[1]	
Pressing	1s. od. to 2s. od.	
Disposal of residues	9d. to 1s. 1d.	

A year ago, in referring to this same subject, I stated that of all the processes put forward at Kalgoorlie, the "roasting" and "Diehl" had alone survived, and that the latter process would probably disappear as such in favor of a combination process in which the refractory portion of the ore would be concentrated-out and roasted, amalgamated and cyanided; and the unroasted slimed tailings either treated by cyaniding alone or, if they contained more than 0.5 per cent sulphides, with the addition of bromo-cyanide. This prognostication has now been completely verified. The Diehl process, as such, survives at Hannan's Star alone, the low-grade ore of which—as stated by the writer whenever he has referred to bromo-cyanide—made it just one of the propositions for which the Diehl process was particularly suitable, because the practical difficulty or impossibility of obtaining absolute high extractions by bromo-cyanide treatment alone has caused its use to be generally limited to pulp containing under 0.5 oz.; and it will be noted that the high extractions claimed where bromo-cyanide is employed are the result in each case of the percentage recovered by amalgamation or by roasting. Thus, at the Hannan's Star the actual extraction obtained by bromo-cyanide is between 80 and 90 per cent only, the balance being recovered by amalgamation; and at the Lake View the extraction on the material actually bromo-cyanided is only 81.5 per cent, whereas the extraction on the richer material roasted is 98.7 per cent, and it is this latter extraction (which is responsible for over half the output) which brings the average extraction for the whole treatment up to the 90 per cent claimed.

The success, however, of the combination process—and it might appropriately be called the "Bewick Moreing" or "Prichard" process—which has taken the place of the original Diehl process, is undoubtedly the metallurgical feature of the year. Its advocates have had a tough fight against the all-roasting process, for which the Merton furnaces have decreased the roasting costs to 3s. per ton. The question as between the two processes at first sight seems absolutely simple: Shall one roast all the ore at 3s. a ton; or shall one concentrate out a portion of the ore at so much per ton, roast this at so much, cyanide it at so much, and slime the tailings from the concentrators and bromo-cyanide these? But experience has shown, as the figures above prove, that the cost of the concentrating out and treatment of the rich concentrates, and also of the fine sliming—which consumes ½-h. p. per ton—and bromo-cyanide treatment of the tails apparently still equals, if it does not exceed, the cost of the all-roasting process.

The next move, therefore, of the energetic advocates of the combination process should undoubtedly be to reduce the cost of sliming and bromo-cyaniding by applying this only to that material for which it may be absolutely necessary. Thus, if concentration is not successful in removing all the refractory material from the tailings, it may be due to a considerable extent to the finely divided mineral being carried off in the tailings. This should be recovered in the slimes, therefore, by separation of the sands from the slimes. It may not improbably—at least in certain cases—be found possible to treat these mineral-free sands by the ordinary cyanide percolation process and to use bromo-cyanide for the treatment of the mineral-containing slimes only, and thus the heavy expense of nearly 2s. per ton at present incurred in fine-sliming all the ore not contained in the concentrates, would be entirely avoided, as well as the heavy agitation and filter-press costs *on the bulk of the ore,* that is, the sands.

Such a process should probably prove cheaper than the all-roasting process, although it would still be a question whether it could obtain so high an extraction; but there again, although an extraction of over 90 per cent. is absolutely necessary with rich ores, when one comes to the treatment of 10 dwt. pulp one has to weigh carefully whether it is worth while obtaining an extra 5 per cent extraction if it costs 2s. a ton or so to do this.

On looking at Kalgoorlie practice it is remarkable to note the hold which amalgamation pans have obtained. Their use is practically universal at all the

[1]The latter figure is on Oroya Brownhill rich ore and includes 2s. 6d. per ton for bromo-cyanide and 3s. od. for cyanide.

mines which adopted the all-roasting process. The suggestion made, notably by Mr. A. C. Claudet, some six or seven years ago, as to the adoption of amalgamating pans for Kalgoorlie ores, was not received with enthusiasm, but this gentleman has certainly cause for satisfaction at the direction in which recent practice has trended.

Passing on to general details it may be noted that the oil concentration plant, erected at Lake View and tested during the year, does not appear to have been sufficiently successful to cause the adoption of the process by the Lake View company.

With reference to the use of bromo-cyanide, it should be noted this is now usually made on the spot from imported bromo-salts, in view of the difficulty of getting the steamship companies to carry the actual bromo-cyanide crystals. The *modus operandi* is as follows:

Bromo-salts include potassium bromide and bromate, roughly in the quantities required for the reaction; assuming this to be

$$2KBr + KBrO_3 + 3KCy + 3H_2SO_4 = 3BrCy + 3K_2SO_4 + 3H_2O,$$
$$238 + 167 + 195 + 294 = 318 + 522 + 54$$

The sulphuric acid is made locally, the strength varying from 60 to 90 per cent. Bromo-salts imported from Germany are very impure, but contain the correct mixture to satisfy the above reaction. The charge used at Kalgoorlie to generate 100 lb. of BrCy is: mixed bromo-salts 125 lb., cyanide (100 per cent) 65 lb., sulphuric acid (70 per cent) 147 lb. These salts are agitated in a wood or lead-lined vat of about 200 gal. capacity, securely covered by a lid, through which a revolving paddle or stirrer works; above this is a smaller vat in which is stored the necessary charge of cyanide dissolved in 40 gal. of water. The vat is first three-quarters filled with water, the agitator started, and the sulphuric acid added slowly and carefully; the whole charge is now left to stand until cool, say, one hour, as the great heat generated by the addition of the H_2SO_4 would destroy the bromo-cyanide. When cool, the mixed "bromo-salts" are added gradually and the solution of cyanide run in simultaneously with constant stirring; the reaction commences almost immediately, but it is not thoroughly completed until after six hours' continuous agitation.

The end of 1903 finds the prospects of the Kalgoorlie field brighter than they have been for many years. The good work done, referred to above; the gradual elimination of the amateur-expert chairman on the boards at home; the extension of the Brownhill shoot, and the good results obtained by the Great Boulder and other mines in depth, all have tended to infuse fresh vigor into the life of this field.

With reference to further reductions in costs, these must mainly be looked for in the cheaper production of power, the avoidance of power and labor on material for which it may not be necessary, and the gradual displacement of labor as by mechanical excavation in the case of sands.

FIRST ZINC-BOX IN THE KALGOORLIE GOLD-FIELD.

THE EASTERN STATES OF AUSTRALIA.

By F. DANVERS POWER.

Queensland.—The output from the Queensland gold-fields has been very good this year, and in certain cases new records have been made. The gold production for the first nine months was 480,100 oz. fine, being an increase of 38,430 oz. over the same period of last year.

Charters Towers has a greater number of assured profit-making mines than formerly, and is the most promising field in this State.

Gympie made its record monthly yield in September. As examples of how these mines pay, we may mention No. 2 South Great Eastern with 144,000 shares which have been paid up to 4d. each; this has paid 11 dividends during the year, totaling 14s. per share; the South Glanmire & Monkland, with 120,000 shares paid up to 2s. 11d. each, has also paid 11 dividends, which totaled 10s. 9d. per share. The West of Scotland mine has a shaft which boasts of being the deepest in Queensland, it being 3,069 ft. deep, with good ore at the bottom.

Croydon shows signs of a revival, a larger number of mines being productive than for a long time past.

At Ravenswood, now over 30 years old, the Politician paid a dividend.

Mount Morgan has kept up its regular monthly dividend of threepence per share, amounting to £137,500 for the first 11 months of the year. The dividends paid by this mine from 1886 to the end of the last half year amounted to £6,229,166. Over 20,000 tons of ore are treated per month; this is in two classes, the oxidized and the 'mundic.' The latter is the ore now principally used, and had an average grade for the first part of this year of 10.62 dwt., equal to 42.17s., or 14s. less than the average for the preceding year. The cost of mining and treating this is 26.93s. Much of the ore in the lower levels contains 2 per cent copper as against 1 per cent in the upper levels. The grade of the oxidized ore was 12.52 dwt., equal to 49.73s., or 8.12s. more than the average for the previous year, and it cost 14.73s. to mine and treat. Very satisfactory developments have taken place at the 750-ft. level, which has given an increased lease of life to this mine. A steam-shovel is being used to remove the over-burden and lay bare ore that will pay to work by open-cut, but would not pay to mine by underground methods. Some excitement was caused in the township of Mount Morgan by the discovery of gold by some boys while sinking a well in a back yard. This resulted in a portion of the township being pegged out, but the find did not amount to much, so in a few days matters resumed their ordinary aspect. There was also a small rush to the Dee river, near Mount Morgan, but this, like so many other rushes in other parts of Australia during the year, proved a 'duffer.'

The New Chillagoe Railway & Mines Company, raised on the ashes of the original Chillagoe Railway & Mines Company, started work in the early part of the year and has been working ever since. The company is now about to erect a converter plant for the copper matte.

The Mount Garnet Freehold mine has had to close down as being unprofitable. The Smith's Creek and Stannery Hill tin mines have also not come up to expectations.

New South Wales.—The following are official figures showing the general production of this State for the first three-quarters of the year:

			Valued at
Silver, ingots and matte	814,861	oz.	£82,032
Silver-lead, concentrates and ore	246,201	tons.	901,363
Copper, ingots, matte and ore	7,715	"	366,544
Tin, ingots and ore	1,431	"	177,400
Coal	2,866,146	"	1,336,561
Total value			£2,863,900

This is an increase of £204,639 as compared with the corresponding period of last year, which is due to the exports of coal, copper and tin, the export of silver-lead concentrates and ore showing a decrease of £109,336. The above figures for copper and tin include metal to the value of £47,139 and £71,494 respectively, refined in this State from imported ores. With these exceptions, the figures represent the output from the mines of New South Wales. The gold output for the first nine months of this year was 203,982 oz. fine, being an increase of 19,949 oz. over the corresponding period for last year.

Gold dredging has found its level in this State. The eleven companies now at work have produced 41,180 oz. up to date; only five of them have paid dividends, aggregating £21,700.

Beach mining has taken a fresh lease of life in the Wardell district, where several parties have pegged out claims during the year. At Nerrigundah, which is rather a patchy field, several rich finds have been made. Attention has been paid to the old Hillend gold-field of late; one mine has recently been floated, and is at present in good ore. Some cheap mining and gold treatment has been carried out at the Homeward Bound mine, Yalwal, where the average returns on 2,273 tons of ore treated during five weeks was 1½ dwt. per ton; the recovery was 23 grains by amalgamation and 13 grains by the cyanide process, the entire cost of mining, milling and cyaniding being under 5s. per ton. The English-owned Gallymont Gold-fields Company has been wound up, after an unfortunate history so far as the English shareholders are concerned. Some of the saddle reefs at Tucker's Hill, Hargraves, are turning out well. The Mount David gold mine, after being in existence for a good many years, has paid its first dividend. The Australian Gold Recovery Company has purchased the tailings of the Aladdin and Wentworth companies at Lucknow and those of the Eleanora Company at Hillgrove; at both places cyanide plants have been erected to treat the tailings.

The great event of the year at Broken Hill was

the rise in the price of lead, which enabled some of the mines that were practically closed down to re-start, and those that had kept going on a reduced scale to increase their output. During the depression only the Proprietary and the South Broken Hill mines were able to pay dividends, while only two others, the Central and Block 10, continued to produce. The mines which shut down included Block 14, British, Junction, Junction North, and the North Broken Hill; of these, the British was the first to start work. Scarcely had the Hill commenced to look like itself again before the drought made itself felt to such a degree that, for the first time in the history of this field, all the mines had to be closed down temporarily, thus affecting 5,260 men employed, in addition to their wives and families and the local business people. The failure of the Stephen's creek water-supply came as a surprise to most of the inhabitants, who were entirely unprepared for such a contingency. On account of the isolated position of Broken Hill, from which only those who had means could afford to escape, the government had to come to the rescue by providing relief work for the unemployed, arranging for water trains, and even had to provide free food for those who were hard up. The Proprietary promptly took measures to re-start work by erecting a large condensing plant, and pumping water from the old Potosi and Cosgrove shafts three miles away, so that soon a large number of the old employees were at work again. Until sufficient water could be had to re-start concentrating the ore, the Port Pirie works were kept going with material from the sintering works, ore on hand, and ore mined from the carbonate stopes. Block 10 and the Central mines were able to work part time with the help of water delivered by trains. Owing to the subsequent heavy rains, there are now twelve or fifteen months' supply of water on hand.

At the Proprietary mine the method of stoping broken ground by the cross-cut system, recently introduced, has been found satisfactory. The Delprat process for separating zinc from the lead ores has proved a success, and consequently the plant has been increased so as to have a capacity of 1,000 tons per week. The Huntingdon-Heberlein process has also been very satisfactory; the present plant is capable of treating 2,500 tons per week. The extraction of ore from the open-cut has practically ceased, the economic limit having been reached. The lode has been cut at the 1,000-ft. level; this is an event which adds greatly to the life of the mine.

The Queensland Smelting Company has taken over the control of the Pinnacles mine.

The Mechernich magnetic separator plant erected at the Central mine has been doing good work.

The Australian Metals Company has erected several Ulbrich separators at West Broken Hill, so as to treat the heaps of tailings and middlings that they have bought.

The Conrad Silver Lead mine and the Conrad South Blocks have been amalgamated and floated as the Conrad Consolidated Mines, Limited, and are under the management of Mr. John Howell. This mine is a large producer of stannite, for which satisfactory returns could not be obtained from custom works; so a plant has been erected for its treatment on the spot, the products being copper matte and tin-lead bullion.

The Great Cobar copper mine, which was under offer to a London syndicate, did not change hands, but the tributers who were also large shareholders have arranged to buy out the old company so as to have sole control.

The Lloyd Copper Company at Burraga, which used to smelt its ores to a matte at the mine, and send this to Lithgow for further treatment, now brings the matte to blister copper at the mine, and only refines this at Lithgow.

The Crowl Creek copper mine in the Nymagee district is developing well, and reverberatory furnaces have been erected at the mine for treating the ore.

A fair amount of molybdenite has been turned out from the Kingsgate mines during the year.

The New Wylie creek dredge is the first dredge of the bucket type erected in New South Wales for working tin gravels that has paid a dividend; but the so-called hydraulic dredges at Cope's creek near Inverell have paid dividends.

The Malacca diamond mine, near Inverell, has restarted work again. A syndicate has been formed to work the Walcha graphite deposits; an asbestos property at Gundagai has also been started. The Great Australian Quicksilver Mining Company at Yulgilbar has produced the first quicksilver in bulk obtained in this State.

The finest specimen of first-class opal ever discovered at White Cliff was found in February, 20 ft. below the surface. The opal portion of the specimen weighed about 22 oz. and is reckoned to be the largest piece of first-class opal in the world. Another splendid find was made in October, when one gem was unearthed weighing 21 oz. and another 14 oz. Opal has lately been found at 73 ft., which is the greatest depth at which it has been found on this field.

The Caledonian Coal Company has proved a seam of bituminous coal on its property at Cessnock, near Maitland, 31 ft. thick, the bottom being at a depth of about 300 ft. from the surface. This is the same seam as that worked at the Pelaw Main and other collieries in the Maitland district, only it is thicker.

The Sydney harbor colliery has reconstructed and is now continuing the sinking of the Jubilee shaft for ventilation purposes; this has to be done before the opening up of the seam at 2,880 ft. can be continued.

The Industrial Arbitration Act now in force, which was intended to avert strikes, has not been successful in that respect, for miners, especially those connected with coal mines, have gone out in spite of it. They put the employers to as much trouble and expense as possible, and then when the law is about to be enforced they ask to be taken back, relying on the employers doing what they require rather than let the mine remain idle longer. The Act has also been used in a way not intended by the framers, as the employees of most mining districts have seized the opportunity of applying to the Arbitration Court for a rise in wages and shorter working hours, which, if granted, in many instances would necessitate the closing down of the mines, thereby doing the workers more harm than good.

Victoria.—Victoria is still the largest gold producer of the eastern States, having yielded 547,509 oz. fine gold for the first nine months of this year, or 24,502 oz. more than during the same period of last year.

The yield from the Bendigo gold-field is improving, as shown by the figures for the first three quarters of this year: First quarter, 46,358 oz.; second quarter, 55,589 oz.; third quarter, 61,529 oz. During this period £216,622 has been paid in dividends. The October yield is the largest of any month since December, 1875. The mines on the New Moon line of reef have been the most productive on the field, the South New Moon being the largest gold producer in Victoria. The New Chum Railway has struck free gold at the greatest depth gold has ever been found in Australia, viz., at 3,876 ft. The Victoria Quartz mines, also on the New Chum line, has cut gold-bearing 'stone' at 3,814 ft.

The Long Tunnel Extended, at Walhalla, has paid off its debit balance, and is now the second largest gold-producer in Victoria. The Long Tunnel Company is sinking its new shaft to a depth of 3,500 ft. The first 955 ft., which was sunk in two sections, was sunk at the rate of 38 ft. per week, which is a record for Australia.

Of the various small rushes that have taken place in various parts of Australia during the year, that of Waanyarra, near Tarnagulla, appears to have been the chief. The lead is narrow, but some fairly large nuggets have been obtained. Mining was delayed for a time owing to the workings having been flooded by a thunderstorm.

The work of developing the Victorian deep-leads in the Lodden valley is being proceeded with. The electric plant of the Deep Leads Transmission Company, Ltd., which supplies the necessary electric power to the Charlotte Plains Consolidated Gold Mines and the Junction Deep Leads of Victoria, Ltd., is the finest of its sort in Australia owned by a private company.

The miners of the Outtrim, Howitt, Coal Creek, and British & Jumbunna Collieries, in south Gippsland, again went out on strike in the early part of this year, former clemency on the part of the mine owners have been unappreciated. The latter, getting tired of these constant strikes, employed non-union men, and the mines are now working satisfactorily.

An organized strike of the railway employees of the State took place in May, which for the time being paralyzed trade, but the government made a firm stand, and the strikers were badly beaten after a struggle of a week. The strike leaders and those who took an active part against the authorities were the chief sufferers, as they lost their positions and pensions, and though some of them went to South Africa to find fresh employment, they soon discovered that strikers were not wanted in that country, so have since returned.

South Australia.—The rush which took place to the Arltunga gold-field at the early part of this year proved to be disappointing, both to those who proceeded there, and to those who joined syndicates with the object of taking up properties. This is another instance of distance lending enchantment. There were many contradictory reports at first, and those who did not unduly praise the field were blamed by others as if the adverse reports had driven the gold out of the 'stone.'

At Kangaroo Island, south of York Peninsula, the Aororangi Gem Company of Adelaide is mining for the precious varieties of tourmaline. Stones of various shades of green, blue, lilac, pink and red have been found.

The phosphate deposits opened up at Clinton, Robertstown and Burra have not proved so good as was at first expected, owing to the large percentage of phosphates of iron and aluminum present. The phosphate is, however, still being mined and sent to the Wallaroo works for conversion into superphosphates.

The government geologist has made an unfavorable report on the Meningie oil country, and concludes that the oil found in the Coolmasson well must have been introduced from outside sources.

The South Australian government has not been fortunate in the working of its metallurgical plants. It has cyanide plants at Mt. Torrens, Petersburg, Tarcoola, and Arltunga, and copper smelters at Port Augusta and Port Darwin. Each of these has proved unprofitable and has been worked at a loss.

Tasmania.—The Tasmanians propose to make an alteration in their mining laws which should have the effect of encouraging capitalists to invest their money in the mines of this State, as they will have a better security of tenure than formerly. So far, all the Australian States insist on certain labor covenants being fulfilled, in order to insure that a lease will be continuously worked. It is now proposed to substitute a minimum expenditure per acre per annum, and to allow money actually spent on mining, whether on labor or machinery, to count; and, within certain limits, the money spent in excess during one year can be carried forward to the next. This prevents men who go on strike, and will neither work themselves nor allow others to work, applying for a forfeiture of the lease on account of the non-fulfilment of the labor conditions, in their endeavor to force the hands of the mine owners. The Victorians are wisely proposing to insert a similar clause in their Act, and no doubt the other States will eventually be forced to do likewise later on.

The Mount Bischoff mine continues to be a con-

sistent monthly dividend payer. There are 12,000 shares in this mine, and during the first ten months of this year ten dividends of 7s. 6d. each have been paid, amounting to £3 15s. per share.

The Tasmania mine at Beaconsfield, the premier gold mine in Tasmania, which has lately been the subject of several abortive negotiations, has finally been sold to English capitalists.

What is supposed to be the missing Loane's reef has been picked up in the New Golden Gate mine, Mathinna, south of the slide, showing a good width of payable ore. As this reef has not been worked south of the slide between the 1,600-ft. level and the surface, the find is likely to be of great value to the district.

Osmiridium has been discovered and worked in the creeks of the serpentine country between the Huskinson and Wilson rivers in the neighborhood of Zeehan.

The low-grade argentiferous lead-zinc properties of the Magnet Silver Mining Company and the Hercules Gold & Silver Mine have succeeded in reaching the dividend paying stage this year. The companies have not succeeded in finding a suitable process for treating their ores, so still sell them to custom works.

The Western Silver mine, situated at Zeehan, has been sold in London this year, and, after having been closed down for a time, has re-started work.

The consolidation effected, during the year, of the Mount Lyell Railway & Mines Company with the North Mount Lyell will prove of benefit to the shareholders of both companies. The former company has a large low-grade copper proposition of basic ore, while the latter has richer but silicious ore, so by blending the two, and treating them at the Mount Lyell smelting works, which are more conveniently situated than those of the North Lyell, great economies are effected, and it is hoped that under the guidance of Mr. Sticht the disputes and mistakes that have characterized the management of the North Lyell in the past will now cease. On account of the large number of shareholders, consequent on the consolidation, the directors have decided to pay dividends half yearly instead of quarterly, as formerly. When these two properties were fused into one, notice was given that a uniform rate of wages would be paid for a similar class of work on both mines, which meant that in some instances the current rates at the North Lyell would be somewhat reduced. A meeting of the men affected was held, and a strike threatened, but eventually better counsels prevailed. The capacity of the furnaces has been increased and the fuel consumption decreased, thus reducing the working expenses and permitting the utilization of ore of a lower percentage in copper than formerly. The electrolytic power plant has been extended to the reduction works, thus effecting further economies.

MINING IN THE AUSTRALIAN BUSH. VENTILATION WITH A WIND-SAIL.

CYANIDATION IN THE UNITED STATES.

By Charles H. Fulton.

A number of improvements have been introduced in the cyanide process during 1903 and are now being tested in various mills.

Charging and Discharging Tanks.—Among the most important innovations is the Blaisdell cyanide vat excavator and the centrifugal pulp distributor. The excavators and distributor work on the principle of the disk harrow. These machines were described by Butters and Crank in the JOURNAL of December 5, 1903. The excavators find their application where sluicing is out of question, or where its cost is considerable. Plants with these machines have been installed at Virginia City, Nevada, at the Gold Road Mining & Milling Company, at Acme, Arizona, and by El Oro Mining & Railway Company in Mexico.

Treatment of Slimes.—A new method of slimes treatment has been evolved by Mr. Charles Moore, which promises well. It is in operation successfully at the large mill of the Mercur Consolidated Mines Company, Utah, and is being installed by the Dexter Mining Company, at Tuscarora, Nevada, and by Lundborg, Dorr & Wilson, near Terry, S. D., in the Black Hills. Other Black Hills plants are experimenting with the method. The process consists of immersing filter frames covered with canvas in the slimes, and employing suction on the inside of the frames so as to cause the slimes to adhere to the outside surfaces of the frames in thin layers. The frames, with the slimes-cakes, are then transferred into weak cyanide solution and water, successively, being washed by drawing the solution through them by suction. Then the slimes-cakes are caused to peel off by changing the suction to pressure. The advantages of the process are compactness of installation and the discharge of comparatively dry slimes. The cost of treatment is low. The system is described by George Moore in the JOURNAL of December 5, 1903.

Filter-pressing of slimes finds but little application in this country. The Confidence mine, in Tuolumne county, Cal., employs a filter-press in slimes treatment, as does the Greenback mine in southern Oregon. The Sunshine mill in the Mercur district, Utah, which has a filter-press plant, is idle at present.

The Argo continuous filter-press is an innovation in the treatment of slimes. It consists essentially of a traveling belt of cloth on which the slimes are fed. This cloth passes, in one place, over the opening of a vaccuum chamber, where the solution is sucked from the slimes, the dried slimes (containing 13 to 15 per cent moisture) being removed from the belt by scrapers. The machine is described in the JOURNAL of October 17, 1903.

At the Homestake experimental plant at Lead, S. D., some very interesting experiments relative to slimes treatment have been made by the De La Val Company with centrifugal separators. The slimes-pulp is fed to a centrifugal separator which concentrates the pulp so as to increase the percentage of sulphides. The concentrated material is mixed with cyanide solution in an agitator and is then separated from the slimes by re-treatment in the separator. The washing with water is done in a similar way. The slimes are said to be discharged with only 3 to 5 per cent moisture. A difficulty to be overcome is to make the operation continuous. The centrifugal separator is also employed in the Elmore oil concentration process.

Any slimes treatment process is of considerable interest to cyanide metallurgists. At present the decantation process is applied extensively in the Black Hills and elsewhere in the United States, but its imperfections are evidenced by the eagerness with which cyanide men turn to any new slimes process.

Just what constitutes a "slime" has been under discussion by metallurgists recently. The tendency is to not refer to the size of particles, but to such physical properties as prevent the percolation of solutions. See JOURNAL of October, 1903.

Crushing of Ore Preliminary to Cyanidation.—Direct wet-crushing of ore in cyanide solution is still in the ascendency, whenever the nature of the ore permits of it. Most mills of this type crush with stamps, but during the year the Bamberger-De Lamar plant, at De La Mar, Nevada, the Lassen Mining Company, in Lassen county, Cal., and Lundborg, Dorr & Wilson, at Terry, S. D., have installed the Monadnock roller mill for crushing. At the De La Mar plant twelve 6-ft. mills are in operation, which crush about 46 tons each through a 30-mesh screen in 24 hours. The ore is largely a hard quartz. A lower consumption of power is claimed. One of the chief advantages, at least for small mills, is the lesser cost of installation. The wear of metal is the same as in stamps, and as regards the product made, it contains less slimes than the product of the stamp-mill.

The Refining of Precipitates.—More attention is paid to the refining of precipitates since the realization has come that considerable loss takes place in the ordinary operations. The method in use at the Homestake mills represents a distinct advance. The precipitates from the filter-presses are treated first with hydrochloric acid to remove the lime salts, and then with sulphuric acid. The supernatant liquid in each case is forced through filter-presses to remove suspended gold. The acid-treated precipitates are also forced through the press and washed, then removed and partially dried, mixed with fluxes, litharge and powdered coke, and finally briquetted. The briquettes are fused in a cupelling furnace to lead bullion and slag, the bullion being later cupelled. The slag is re-treated with litharge in a small blast-furnace, as described by C. W. Merrill in the JOURNAL of March 7, 1903.

At the Penobscot mill, at Maitland, S. D., the sulphuric acid from the treatment of the precipitates was run through a tank containing the waste zinc fines from the zinc lathe. This tank, when cleaned up after about four months' run, yielded over $1,000 in bullion, whether from gold in solution or suspended gold is uncertain. The Penobscot mill is a modern one and its clean-up facilities are excellent, showing that there is certainly room for improvement in the method generally employed.

Amalgamation after Cyanidation.—Two mills crushing in cyanide solution have installed plates to catch free coarse gold not taken up by the solution. These plates are situated so that the tailings can be sluiced over them. Plates of this type are said to be in successful operation at the Annie Laurie mill in Utah. The same scheme is being tried at the Hidden Fortune mill, below Deadwood, S. D. There a special device, consisting of a distributor with finger-boards, is employed in endeavoring to get a uniform flow over the plates. The device has not as yet had a thorough trial.

Cyanide Poisoning.—According to Martin and Jenkins, hydrogen peroxide, advocated much at one time as an antidote in case of cyanide poisoning, is in all cases inefficient on account of its slowness of action. Ferrous sulphate with oxide of magnesia and dilute potash solution, as described in the JOURNAL of August 8, 1903, was found to be the most efficient antidote.

Regeneration of Waste Solutions.—Many mills are endeavoring to get a satisfactory method to regenerate potassium cyanide from waste mill solutions. The Smuggler-Union tried a process for some time, which, however, has recently been omitted from the mill scheme. The Camp Bird mill, also in Colorado, has a recovery process in operation which is said to be successful.

World's Production of Gold by Cyanidation.—According to G. T. Beilby, the world's production of gold bullion by cyanide process in 1900 was 1,826,053 oz. of bullion. During that year the Transvaal produced but 85,000 oz., owing to the war in South Africa. The production of mill bullion by cyanidation in the United States during the same year was 497,280 oz.

General Review by States: Arizona.—Cyanidation has made considerable progress in this region. The largest plant constructed and placed in operation during the year is that of the Gold Road Mining & Exploration Company, at Acme, Mohave county. The capacity is 200 tons per day. The ore is crushed by rolls, a separation of dust being made by dry separators, the dust being treated separately in agitation tanks. The sands are treated in 16 30-ft. leaching vats in the open; the crusher house, precipitation boxes, and engine and boiler rooms alone being enclosed. The vats are charged by means of belt-conveyors and Blaisdell distributors.

In the same county, at Gold Basin, the Cyclopic mine is installing better cyaniding equipment. In the Cedar district the Yucca Mining & Milling Company is operating a 50-ton plant, and in the Weaver district the Virginia mine is adding a mill.

In Maricopa county, the Socorro mine, west of Wickenburg, has placed its new milling plant with cyanide annex in operation.

In Yavapai county, the plant of the Congress Gold Mining Company has been active; 80 stamps are wet-crushing the ore, consisting of white quartz and pyrite and having an average value of $15 per ton. The pulp is concentrated on tables and the tailings are separated into coarse sands and slimes. The sands are leached directly, and the slimes are roasted and then cyanided. The capacity of the plant is 300 tons per day. At Rich Hill the Octave mine has a plant in operation stamping and amalgamating 130 tons per day, then concentrating and cyaniding the sands of the tailings. West of Prescott, the Hillside group of mines has a small mill and cyanide annex in operation. The Gold & Copper Mining and Milling Company also has a small plant at work near Prescott.

Near Val Verde, the Iron King mine has a small mill and the American Copper Company has constructed a small dry-crushing pneumatic cyanide mill, the ore being crushed by rolls. In Santa Cruz county, the Gold Rock Consolidated Company at Oro Blanco is installing a cyanide plant.

California.—In this State, cyanidation has been active; the largest new plant constructed during the year is the Sand Pile mill, near Forrest Home, Amador county, to treat the great quantity of old tailings from the Plymouth Consolidated mills, running in value from $1 to $2 per ton, and carrying considerable slimes and fine sulphides. The plant cost between $30,000 and $40,000. In San Benito county, at Ludlow, the Bagdad Mining Company is adding a 200-ton mill as an adjunct to plate amalgamation.

In Kern county, at the Esther group of mines, a 100-ton mill with rolls for dry-crushing is under construction. At Randsburg the Stanford plant has added a cyanide mill and the Echo mine is constructing a mill at Mohave, where the Exposed Treasure mine is also operating a small plant.

In Alpine county, the Curtz-Evans Mining & Milling Company has a new 50-ton pneumatic cyanide plant.

In San Diego county, the California King Gold Mining Company's 1,000-ton plant at Picacho has been in operation part of the time, treating 350 tons per day, and at Hedges the tailings plant of the Gold Fields of California, Ltd., formerly the Free Gold Mining Company, is to enlarge its tailings plant from 300 to 1,000 tons per day.

In Mono county, the Standard Consolidated and the Del Monte plants have been in operation.

In Lassen county, the Lassen Mining Company has erected a 70-ton plant, crushing the ore in roller mills previous to cyaniding.

In Plumas county, the Plumas Gold Mining Company has installed a cyanide plant as an adjunct to a 15-stamp amalgamation mill.

In Tuolumne county, at Jamestown, the Rawhide mine has enlarged its cyanide capacity to 100 tons, and is treating pyritous concentrates by cyanidation in place of chlorination. The Mount Jefferson mine near Groveland also treats concentrates by cyanidation. The new 100-ton tailings cyanide plant of the Confidence mine has been placed in commission. Near Columbia, the Dinsmore mine has kept its cyanide plant busy.

In Siskiyou county the cyanide mill of the Helena Gold Mining Company is at work treating 60 to 70 tons per day, and near Gazelle the Dewey mine is operating a 10-stamp mill with cyanide annex.

In Mariposa county, at Mount Bullion, the McLeish tailings mill is to increase its capacity from 30 to 70 tons per day.

In San Bernardino county, the Gold Peak Company, at Victor, has installed a small cyanide annex.

In Inyo county, the Anvil Springs Mining Company, at Anvil Springs, has constructed a small plant.

Colorado.—No new plants of any size have been constructed in this State during the year.

The Sanger Mining & Milling Company, at Jasper, has erected a 100-ton pneumatic cyanide plant, and the Wano Mining & Milling Company, at Jamestown, Boulder county, has a 50-ton pneumatic cyanide plant. The ore at this place is dry-crushed and roasted in part.

In the same county the Magnolia Mining & Milling Company is remodeling the old Nellie Bly mill for cyanidation.

In Fremont county, at Querida, the new Bassick mill concentrates the ore and cyanides the tailings.

In Gunnison county, the Jersey Blue mine, at Ohio, has a 25-ton pneumatic cyanide plant in operation.

For the higher grade, unaltered, milling ores of the Cripple Creek district, chlorination has the preference, the Dorcas mill at Florence being the only cyanide mill in operation. Interesting work, however, is being done in a number of small mills in Cripple Creek on the low-grade oxidized ores. The Globe Reduction Company (Temple & Ross) has converted the old Van Fleet sampler near Goldfield into a cyanide plant employing coarse crushing and cyanidation without roasting. This mill is said to be in successful operation on ores from the Ironclad mine. There is also a small plant on the Magna Charta, on Ironclad hill, erected by the Cripple Creek, Homestake, Mining & Reduction Company, to treat the mine dump without crushing.

On Copper Mountain, the Lois mine has a small plant with crushing rolls and four 85-ton leaching tanks. At Colorado City, the Colorado & Philadelphia mill has resumed operations after a labor strike, and is treating Cripple Creek tailings. The Bi-metallic mill at Cyanide has been dismantled.

At Colorado City, the Telluride Reduction Company's mill has been in operation part of the time, employing bromine in conjunction with cyanide. This, however, is more properly a bromination mill.

In Ouray county the new cyanide plant of the Camp Bird mine has been in steady operation treating 150 tons of tailings per day, although its capacity is 200 tons. Only the sands are treated at present, the slimes being accumulated by tailings dams. The cost of cyaniding sands is 73c. per ton, according to Messrs. Woods & Doveton.

In San Miguel county the operation of the Liberty Bell and Smuggler-Union mills has been intermittent, owing to unsettled labor conditions.

At Leadville, on Breece hill, the Ballard mill, a 50-ton experimental plant, has been erected to treat the low-grade silicious iron sulphide ores, but with what success is not known. Experiments have also been carried on with Clear Creek county ores, and several large plants are projected.

Montana.—Cyanidation has been very active, especially in Fergus and Madison counties. In Fergus county the mill of the Gold Reef mine at Gilt Edge has installed two roasting furnaces, and the Barnes-King mills have made changes in their screens, etc. The Kendall mills have been treating a large tonnage of $6.50 ore. The Chicago & Montana Company, in Whiskey gulch, has put its plant in commission. The output of gold by cyanidation in Fergus county for March was $71,095 and for November $74,411, showing a steady increase. Several new plants are projected in this region.

Madison County.—At Norris, the Revenue Mining Company is building a 100-ton plant, and at Virginia City the Kearsarge mine has a 60-stamp mill with cyanide annex under construction. At the Eastern mine, the stamp-mill and cyanide annex have been put into operation.

In Park county, at Jardine, the Kimberly and Montana Gold Mining Company has erected an 80-stamp mill with cyanide annex, which is now at work. The Revenue Mining Company also has a plant under construction.

In Lewis and Clark county, in the Marysville district, the Montana Mining Company has had its tailings plant in operation, and the Jay Gould mine of the Standard Ore Company is building a 30-stamp mill and cyanide annex. Two other plants are projected.

In Choteau county, at Landusky, the Alder Gulch Mining Company has completed a 100-ton cyanide plant, which is now at work. Plants are projected in Jefferson, Granite and Sweet Grass counties. In Deer Lodge county, the New Southern Cross Company has a plant under construction.

According to the United States Assay Office at Helena, the production of gold by the cyanide process in Montana for 1902 amounted to 50,402 oz. fine, equal to 23.6 per cent of the total gold production of 212,855. The increase in production by cyanidation over 1901 was 5,445 oz.

Idaho.—In Idaho county the Valley Creek mine has added a cyanide annex to a small stamp-mill. At Buffalo Hump several plants are projected. In Lehmi county, at Ulysses, the Kittie Burton Mining Company has increased the capacity of its stamp mill and added a cyanide annex. At Leesburg the Gold Dust mine is erecting a 10-stamp mill and adding a cyanide annex.

At Bear, Idaho, the Idaho Gold Coin Mining & Milling Company has constructed a 50-ton dry-crushing plant, which was destroyed by fire in October, but is to be rebuilt.

In Shoshone county, at Pierce City, the Wild Rose mine has erected a small cyanide plant. The Grant & Allie Mining Company has a 10-stamp mill and cyanide annex at work. The New Jersey Mining Company near Wardner tried an electric amalgamation-cyanide process without success. At Custer

City, the Lucky Boy Mining Company has a cyanide plant in operation.

At De La Mar, the De La Mar mill, the largest in the State, has been working continuously during the year.

New Mexico.—In Taos county, at Woody, the Glen Woody Company is building a mill and cyanide annex, containing rough crushers, Huntington mills, settling vats and cyanide tanks. In San Miguel county, at Tecolote, Buck & Elliot are operating a 25-ton plant. In Socorro county, on the east side of the San Mateo range, at the Rosedale mine, W. H. Martin & Co. are operating a 10-stamp mill and cyanide annex. Other plants are projected in Taos and Grant counties.

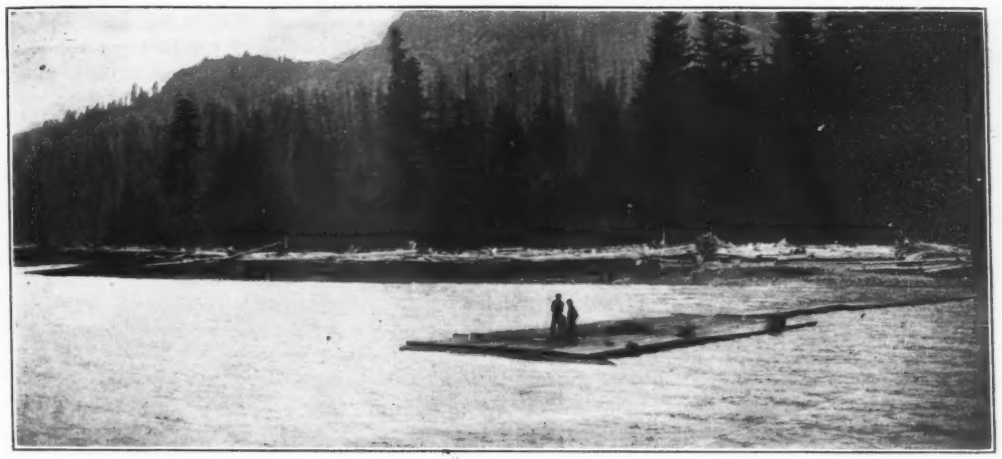
Nevada.—A new plant to go into operation in Nevada is the 275-ton mill of Charles Butters & Co., to treat old Comstock tailings and ore from the Comstock mines.

The mill of the Bamberger-De La Mar Company, at De La Mar, has been entirely remodeled and started to work in June. At Tuscarora, Elko county, contracts have been let by the Dexter Mining Company for the installation of the Moore slimes process.

Oregon.—The Greenback mine, in the Grave Creek district of southern Oregon, is operating a 40-stamp mill and a 100-ton cyanide annex, with a filter-press plant for treating slimes. In Baker county, the North Pole mill was active part of the year, dropping 30 stamps and employing nine percolation vats and six agitation vats. In Grant county, the Red Boy Consolidated mill is shut down pending further mine development. In Okanogan county, at Bodie, a 50-ton amalgamation and cyanide plant are in course of erection.

South Dakota.—Cyanidation has made distinct progress. The new mills that went into operation during the year are the 600-ton plant of the Horseshoe Gold Mining Company, at Terry, treating at present 300 tons per day; the Hidden Fortune mill, below Deadwood, treating 200 tons per day; the Jupiter mill, in Blacktail gulch, treating about 100 tons per day; the Penobscot mill, at Maitland, treating 150 tons per day, and the Golden Crest, in Strawberry gulch, treating 40 tons. Only one new mill is at present under construction, the Lundborg, Dorr & Wilson mill, near Terry. The old Union Hill Company's mill near Galena is being remodeled with a cyanide annex. In Deadwood the Golden Reward plant has been in operation during the year, the Dakota plant has just resumed work, while the Imperial plant and the Rossiter plant are idle. Owing to the high local freight rates on ore, there is a general tendency to place the new mills near the ore supply. It is probable that the Dakota mill will be moved to the mine in the near future. In the Ragged Top district the Spearfish and Deadwood Standard mills have been in steady operation, the former having increased its capacity to about 300 tons per day. In the Yellow Creek district the Wasp No. 2 mill has been steadily at work, treating 125 tons per day. The Alder creek mill has been shut down since June. The large tailings plants of the Homestake Company at Lead and Central have been in operation throughout the year. Several other large plants are projected for the Black Hills. At present 14 cyanide plants out of 20 are in operation, treating approximately 3,800 tons of ore and tailings per day.

Utah.—No new plants of any size have been erected in this State during the year. The plant of the Mercur Consolidated Gold Mines Company has been in operation. During the fiscal year 1902-1903, it treated 335,163 tons of ore, averaging $5.05 per ton, the extraction being $3.84 per ton, and the tailings averaging $1.21 per ton. The cost of milling was $1.58 per ton and of mining $1.30 per ton. The tailings have increased in value from 95c. in 1901 to $1.30 during the first half of 1903, owing to the talcose nature of the ore. This fact led to the installation of the Moore slimes process, which is said to be in successful operation, reducing the average value of the tailings materially. The Sacramento mill in the Mercur district has been in operation throughout the year. A portion of the ore is retorted for mercury previous to cyanidation. The Annie Laurie mill in Piute county has also been active.



DEEP SEA LANDING IN BRITISH COLUMBIA.

THE DINNER HOUR AT A JOHANNESBURG MINE.

MINING IN THE SOUTHWEST.

By William P. Blake.

The term 'Southwest' is here intended to refer to the territory of Arizona, the southern portions of California and Nevada, a vast region, without any organized system of official reporting, so that any review, at the best, cannot cover all that has been accomplished in the way of mining development. Moreover, this brief review is restricted to a notice of the mining of the precious metals and other ordinary metals, with the exception of copper, that subject being dealt with elsewhere by Mr. James Douglas.

Arizona.—In this great region of many mountain ranges we do not find a concentration of lodes in one main range, as in California, but a more general distribution, with greater variety of form and mineral association. As a general rule, there is a larger degree of intermixture with the sulphides of iron, lead and copper in the lodes of Arizona than in those of the Mesozoic slates of California. The persistence of this belt of slates along the western slope of the Sierra Nevada, from Mariposa northward, gives approximately the same lithologic conditions of wall-rock and lode formations through many counties, while in Arizona the uplifts are more numerous and the strata range in geologic age from the Cambrian to the Quaternary, with many plutonic intrusions, and having not one single dominant axis of uplift and plication, but many.

Some of the more extensive and notable of the gold mines of Arizona will be passed in review.

The *Fortuna,* in Yuma county, has been worked through an incline shaft to a depth of 1,500 ft. One shaft was lost by caving early in 1903. The ore has been high-grade, ranging in value from $20 to $30, and even $50 per ton. The total production of this mine, since its opening, has probably been not less than $3,000,000. During the year the production has been steadily decreasing, owing to the loss of the main ore-shoot by complex faulting. Lower-grade ores have been worked, and even the large dump of waste, in which there was some good ore, has been passed through the mill. But exploration under-

ground has been maintained at a large cost; unless success attends these efforts, the Fortuna may be regarded as practically worked out.

The *Gold King* of Arizona, in the same county, is not now in operation, and has been idle most of the year. The workings have reached a depth of 300 ft. or more, and the promise is good for much greater depths. An accident to one of the wells from which water was obtained has retarded operations for the present, and the mine is closed.

The *Congress* mine, in Yavapai county, has increased its production. The total depth reached by the incline shaft is 3,500 ft. on the dip of the ledge. Two other approximately parallel veins have been found by cross-cutting. In the month of March, 1903, a new mill of 40 stamps was added, and now 80 stamps are dropping, about 300 tons being put through daily. The ore is pyritic, and is first roasted, then cyanided.

The numerous gold-bearing veins in the *Bradshaw* mountains, south of Prescott, have been prospected with high promise and success in several instances. The Crowned King mine has been closed by litigation.

The Oro Belle, on Humbug creek, has been in successful operation.

There has been great activity in the development of gold-bearing lodes in the region of *Wickenburg* and of Rich hill, including the quartz claim formerly worked by Johnson. The Leviathan is also under development.

The Vulture has been under investigation, with a view to re-opening and working it to greater depths.

The Mammoth and contiguous gold mines at Shultz, in Pinal county, are still idle.

Gold Mountain.—This prospect, in the Galiuro mountains, of which so much was expected in 1902, has been found to be too low grade, taken in mass, to be worked with profit, and has remained idle. The gold is confined to the little quartz veinlets and the cavities left by the decay of iron pyrite.

Arivaca and Oro Blanco.—These districts, in Pima and Santa Cruz counties, south of Tucson, have experienced a substantial revival of mining. The properties, known as Tres Amigos and the Sorrel Top, both gold mines of great extent and promise, but long idle, have changed ownership and are now being re-opened and equipped with mills. The Old Glory has also been re-opened and worked. The Oceanic is now one of the important gold mines of the Arivaca district. The ore is said to average $10 per ton and to yield about 40 per cent of this on plates, the remainder being suitable for cyaniding.

The McDonald group is in slate near the Old Glory mine; the ore has been subjected to a working test by taking 50 tons over to the mill of the Montana company, where water is obtained from the Cheney reservoir, and working it there by stamping and amalgamation. The Montana mine, upon a large vein of galena and zinc-blende, remains unworked, the cost of transportation being too great to permit of the ore being sent to the El Paso smelter.

Pride of the West.—This large establishment for the separation of pyrite, galena and zinc-blende, with the production of copper matte, closed down early in the year, and has remained idle since. Tentative shipments of zinc-blende concentrates were not followed up.

At Washington Camp nothing of importance has been accomplished during 1903, and the mines are practically idle.

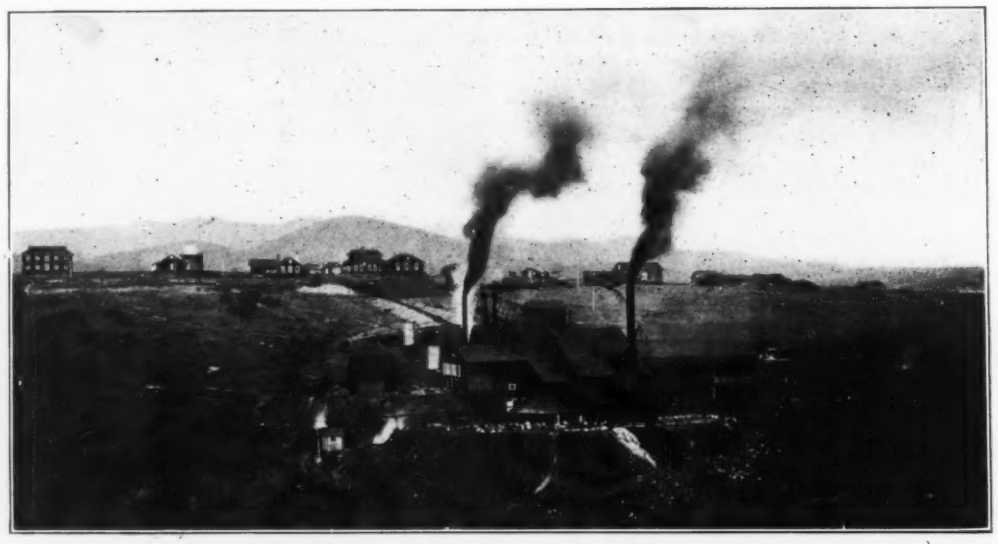
World's Fair Mine.—This famous property, which yields very rich argentiferous galena and copper sulphide, is situated near Patagonia, and is opened and worked at intervals by its owners, Mr. and Mrs. Frank Powers, who have made one or more shipments of high-grade ore to El Paso.

In the *Salero* and *Tyndall* districts there has been considerable prospecting during the year, and shipments have been made from Patagonia (Santa Cruz county) and from the Eureka-Mabel mine at Salero. The ore of this mine consists of a mixture of gray copper, galena and native silver in a gangue of quartz and manganese spar. It occurs in a regular well-formed vertical vein in diorite, and has been opened in ore for over 150 feet.

The Arizona Gold & Copper Company has erected a small concentrating plant, consisting of Davis rolls and concentrating tables, near the Salero mines, but it is not yet in continuous operation.

The *Sierra de Oro* gold properties are situated along the San Francisco river, a few miles above Clifton, in Graham county, and cover a group of gold-bearing quartz-veins traversing granite. These are opened by an adit about 500 ft. above the level of the river and from 600 to 1,000 ft. below the outcrops of the ledges. When these ledges are intersected, drifts will be run each way on the ore, and a mill will be erected on the banks of the San Francisco river, which is less than a mile distant.

In the *Quijotoa* district, the Weldon Gold & Copper Company has done the principal development during 1903; shafts have been sunk and other exploratory work has been carried out. The undertaking is backed by capital from Marquette, Michigan.



VAL VERDE SMELTER, ARIZONA.

The placer deposits of Horseshoe basin have been worked in a desultory way by the Papago Indians, who make fair wages by dry-washing.

Cerro Colorado.—The old Liberty Clark mine, from which regular shipments of argentiferous galena have been made for years, and which was closed down upon the death of Mr. Clark, has been reopened and worked under the direction of Mrs. May Clark.

Harquahala.—There are some evidences of a resumption of active operations in this once prosperous camp.

In the *Tombstone* district, work has continued actively during the year. The mines of this camp are reputed to have yielded over $30,000,000 in gold and silver up to 1882. This was taken out between the croppings and water-level. The consolidation of interests in one organization—the Tombstone Consolidated Mines Company, Ltd.—now permits of working these properties as a unit and the removal of the sea of water which for twenty years has prevented deeper mining.

During 1903 the water has been lowered 100 ft. below the 600-ft. level of the Contention, giving access to bodies of ore which, it is expected, will be fully equal in value to those formerly exploited above ground-water. Pumps of great power and capacity have been installed at the 700-ft. level of the new shaft, and they are expected to be in full operation by January, 1904. The year is also signalized by the completion of the branch railway from Fairbank to the mines, and by the shipment of ores by rail from the mouth of the mine to the smelter at El Paso.

The Common Wealth Mining & Milling Company, with mines at *Pearce*, in Cochise county, has been in continuous operation. The lode has been opened to a depth of 527 ft. on the incline, or 102 ft. below the water-level. The ore at this depth is exactly like that above the water; it has not become more refractory, as was rather expected. Some unusually large stopes, 60 ft. wide, in places, have been opened up in ore of fairly uniform grade. The mill of 80 stamps has been well supplied and the output of bullion has been satisfactory.

Crude petroleum is used under the boilers, and is delivered by rail from Cochise station on the Southern Pacific railway, 17 miles distant. John Brockman is still general manager.

Poland.—The milling of the ores of this property has been discontinued pending the completion of the long adit, which should cut several lodes and add largely to the ore reserves.

Castle Dome.—The mines of this old and well-known district, in Yuma county, have not been actively worked. The ore is a very high quality of argentiferous galena, making a pure, soft lead. It is shipped down the river Colorado from Castle Dome landing to Yuma, and thence by rail to the Selby works, near San Francisco.

Southern California.—Efforts to obtain authentic reports of progress in the southern portions of California have not been successful. It is understood that the extensive gold mines at Picacho have been idle by reason of litigation.

There have been reports of the discovery of valuable gold placers near the Needles, on the Colorado river.

The construction of the line of railway from Salt Lake City to Los Angeles by Senator Clark is an event of great importance to the mining industry of the Southwest. Work upon this line has progressed vigorously during the year and track is being laid at the rate of a mile a day. This road will give easy access to many mining districts which have lain dormant for want of transportation facilities. It will pass through the enormous deposits of iron ore of southern Utah, the largest and most varied, probably, in the United States, made known by Thos. Taylor of Utah, Prof. Geo. W. Maynard and the writer.* These beds of magnetite and of hematite form ridges visible for miles, and are in close proximity to coal and limestone suitable for flux, the region thus having all the required conditions for the successful production of iron and steel, except transportation, which, being supplied, we may soon expect to see great establishments for the production of steel in all its forms, but especially for rails to supply the railways of southern California, Arizona and Mexico, and probably the Orient.

It is reported on good authority that a monster ledge of iron ore has been discovered near the place called the Barrels, on the Mojave river; that it crops out at intervals for a mile and a half, and in places is

*Vide *Transactions* American Institute of Mining Engineers.

100 ft. wide. This is the first great bed of iron ore found west of the Colorado, and is much nearer to the coast than the iron measures of Utah. It is said that the Colorado Fuel and Iron Company has bought iron properties 30 miles from Daggett, and that capitalists from Minnesota have taken bonds on immense iron-ore deposits in the Caves district, six miles beyond the Barrels. The Southwest thus promises to become one of the most important centers of iron production in the United States.

There have been several periods of excitement in Arizona over reported discoveries of petroleum in different parts of the territory, but there is not, as yet, any well-authenticated report of its occurrence in commercial quantities. A circular issued "to the owners of oil lands near Winslow" reports the occurrence of a shale, from two pounds of which a few drops of light oil were extracted.

Crude petroleum from California and from Texas has largely superseded the use of coal or wood for the generation of steam at many of the mines of Arizona. It is now in general use for the locomotives of the Southern Pacific railways. Tanks of large capacity have been placed at intervals along the route, and are filled from tank cars of the usual construction.

Experiments have been made at Tucson, Arizona, with crude oil as fuel for smelting copper or other ores in a shaft furnace, and these have been attended with such a degree of success as to encourage the belief that petroleum may be used successfully and with greater economy than coke. Copper matte from sulphide ores has been produced in considerable quantity at the experimental plant erected at the iron works of Gardner Worthen & Son, and preparations are being made for the building of a plant of large capacity at a suitable locality.

The active interest of the mining public and of capital has been directed during 1903 more to the acquisition and exploitation of copper deposits than to those of other metals. Sonora, Mexico, has been an attractive field of investment, and has diverted attention, in a large degree, from the mineral wealth of Arizona.

The output of gold for 1903 is materially lessened by the closing down of the King of Arizona, by the continued idleness of the Mammoth, and the diminishing production of the Fortuna.

The passage of the eight-hour law by the last legislature of Arizona is regarded by many as a repression of industry and a serious blow to mining.

The opening of new lines of railway now gives access and transportation to many important mining districts, especially those along the route of the road under construction from Phœnix to Florence and beyond, along the Gila and San Pedro to Benson.

GOLD AND COPPER MINES OF THE SOUTH.

By RICHARD EAMES, JR.

The Southern mining field during 1903 has seen two or three remarkable gold developments—the Barringer and Iola mines, in North Carolina. The Barringer produced a pocket of gold-bearing quartz and calcite that yielded several thousand dollars to the ton, and the Iola mine produced nearly $75,000 from a 10-stamp mill.

The older mines, including the Haile mine, in South Carolina; the Creighton, in Georgia; the Gold Hill, Russell, McMackin, Parker, Sam Christian, Fentress, Capps and others, in North Carolina, and one or two in Virginia, have contributed to the output in the usual spasmodic manner, until the production is in the neighborhood of $300,000.

This amount seems very meagre compared with the numerous substantial developments in the mineral belt, but the year has been given over mostly to development. In North Carolina, the Whitney Company has developed at its mines nearly 1,000,000 tons of gold ore; has built seven miles of standard-gauge railroad track, connecting the mines with the Yadkin river, and is preparing to erect a 20,000-h. p. plant. This power will be transmitted to near-by mines, towns and factories, thereby cheapening production, and will prove a great factor in working mines. The Phœnix mine, in Cabarrus county, has done fully $75,000 worth of development, the mines of Guilford county have spent most of the year in opening up new ground, and the same can be said of the Hercules gold and copper mine, at Cid. In Virginia, a promising gold mine has been partly developed near Virgilina. Mill tests have shown the ore to be worth $50 per ton.

The talc, mica, corundum and gem industries are showing some activity. A new industry is the mining and cleaning of rutile by the American Rutile Company, that has a 10-stamp mill and concentrators, and is working a deposit near Roseland, Nelson county, Va. It turns out 1,800 lb. per diem, and ships to the Krupp works at Essen, Germany.

Most of the copper output has been from the Virgilina district, near the border of North Carolina and Virginia, where are several mines that produce rich ore. Guilford county, North Carolina, has made some shipments, as has Rowan county from the Gold Hill and Union copper mines. It is estimated that these mines have many thousands of tons in sight. The Hercules mine, in Davidson county, has also developed good-sized bodies of copper ore, while several of the Cabarrus county and Mecklenburg county mines have made small shipments. Several new deposits have been opened, and the outlook is good for future production, when the ores can be treated nearer the mines.

Several attempts at smelting have been made, which may be considered successful from a metallurgical point of view, but not from a commercial. The Rodfish Mining Company, at Nelly's Ford, in Nelson county, Virginia, erected a Vulcan furnace. It makes a matte running 40 per cent copper, and ships this in small quantities. The Seminole copper-gold mine, in Georgia, has done some smelting and made small shipments.

The desultory manner in which copper mining is carried on makes it difficult to estimate the product, but outside of Ducktown copper mines I would put the output at 25,000 tons of 6 to 7 per cent ore.

A nickel deposit opened near Webster, in Jackson county, North Carolina, bids fair to be important, as does the arsenic-gold plant at Terry's Ford, Floyd county, Virginia.

CALIFORNIA.

By CHARLES G. YALE.

California is now producing from its mines and quarries over $35,000,000 annually, and increasing this output at the rate of $2,000,000 yearly. This may be considered a very good showing indeed from a State where it was supposed that upon the exhaustion of the gold placers the mining industry would become of small importance. While the gold-bearing gravels are by no means worked out, they no longer produce as much as formerly, but other branches of mining have come to the front and largely make up the loss entailed through partial exhaustion of the placers.

In 1852 California produced in gold alone the sum of $81,294,700, and up to 1866 the annual yield was never under $17,000,000. In 1889 the product was only $11,212,913. Since then the yield of gold has gradually increased, until now, and for several years past, it has been about $17,000,000. This does not include silver, copper, petroleum, borax, quicksilver or any other mineral substance.

At present some 44 mineral substances are being utilized, and their relative standing is as follows: Gold, petroleum, copper, borax, clays and their products, quicksilver and silver, in the order named. The metals naturally lead, but large increases are apparent each year in structural materials, hydrocarbons, gases and non-metallic substances generally.

The metals or ores now produced include gold, silver, mineral paint, pyrites, quicksilver, copper, lead, manganese, platinum and chromite. The non-metallic substances are borax, coal, chrysophrase, mineral waters, salt, asbestos, infusorial earth, gypsum, magnesite, lithia mica, fuller's earth, quartz crystals, mica, soda, tourmaline and turquoise.

The hydro-carbons and gases include petroleum, asphalt, bituminous rock and natural gas. The structural materials are brick and pottery clays, portland cement, lime and limestone, macadam, rubble and concrete rock, paving blocks, marble, granite, sandstone, serpentine, slate and glass sand. Very rapid increase is being made in the annual value of some of the above, notably borax, quicksilver, copper and petroleum.

Though gold mining has been carried on in California since 1848, there is now coming annually from the quartz mines about 350,000 oz. a year more than there was 15 years ago. Gold is being produced in 35 counties, and the older districts still maintain their lead. Nevada county, where the first quartz mill in California was erected, is still first, with better prospect of an annual increase than of a decrease, largely because capital has been carefully invested there and the quartz mines are well developed and equipped. Experience has proved that the veins 'go to the deep' and carry as good ore at 3,000 ft. as they did near the surface. These results have had the effect of encouraging others to sink deeper and to extend explorations with vigor.

The quartz mines now show the largest aggregate of yield each year. Out of the $17,500,000 of gold and silver produced, over $13,000,000 is derived from the quartz lodes. The hydraulic mines come next with about $1,200,000, the drift mines yield about $900,000 and the dredging operations about $800,000. The rest is from surface placers, including bar, river-bed, gulch, etc.

The rank of California counties in gold production is as follows: Nevada, Calaveras, Tuolumne, Amador, Kern, Butte, Siskiyou, Shasta, Placer, Trinity, Mariposa, Mono, Sacramento, San Bernardino, Plumas, San Diego, El Dorado, Sierra, Yuba, Inyo, Humboldt, Fresno, Riverside, Madera, Lassen, Tulare, Alpine, Los Angeles, Monterey, Del Norte, San Luis Obispo, Ventura, Colusa, Orange and Santa Barbara. The first two named are each yielding over $2,000,000 annually and the next four over $1,000,000 each. Altogether there are over 22,000 men employed in the gold, silver and copper mines of the State at present.

It was expected that the gold and silver yield of the State for 1903 would exceed that of 1902, but while exact figures have not yet been compiled, it is hardly probable that such will be the case because of two factors, not originally taken into account. One of these was the lack of water in the fall months which caused many large quartz mines and all the gravel mines to close for a period, and the other was the prevalence of labor strikes in certain districts which caused the mines to shut down.

The ditches began to run dry in certain counties early in the fall, shutting off both water and electric power for mines and mills, and reducing the number of stamps dropping or stopping them all until the advent of the winter rains. Only those mines with auxiliary steam-plants were able to keep a full force of men at work. Naturally the gravel miners suffered most and had to quit altogether, with the exception of the drift mines and dredging claims; but some of the large quartz properties were idle for two months or more.

The strike of the miners in Shasta and Kern counties did the most harm, but similar conditions prevailed to a lesser degree in Tuolumne, Amador, El Dorado and Calaveras along the Mother-lode. Local unions have been formed by the Western Federation of Miners and trouble has come where there was no trouble before. Generally speaking, it has not been a fight for increase of wages, as regular union rates prevail; but it has been more a fight for recognition of the union and for the reinstatement of discharged men. The miners would take away the right of the owners to discharge union men, except with consent of the union, while the owners contend for their right to judge the

capacity of any miner; in other words, they will not pay full wages for incompetent men who belong to a union, nor will they be compelled to employ a union man they find unsatisfactory. These differences have caused the closing down of a number of prominent producing mines and the end is not yet. One of the larger mines, a foreign corporation, has obtained a temporary injunction against the local miners' union from a Federal court. This is a new move against the unions.

Development in gold dredging continues. At Oroville, Butte county, there are now some 26 machines at work, and dredges are working successfully in several other districts. Large tracts of land lying too deep for surface work, with insufficient fall for hydraulicking and too poor for drifting, can be worked profitably by dredges. Especially near Marysville, Yuba county, is there much development of this class of land. At one point, where some 2,400 acres in one tract have been acquired, three large dredges are to be put at work shortly, each to cost about $90,000. Tests of the ground lead the owners to believe that some $17,000,000 lie hidden in that and neighboring tracts. The ground itself has been heretofore considered valueless. In other places, orchard, vineyard and farming land has been purchased to be mined by this method, and dredging is now going on in Butte, Calaveras, Shasta, Trinity, Sacramento and Yuba counties. Dredging requires large investments in land and machinery, so that only strong companies undertake it.

Some gold is derived from the copper smelters, particularly in Shasta county, but also from Calaveras, Fresno, San Bernardino and Tuolumne counties. The smelters buy the quartz from the miners for fluxing purposes, paying on assay value. In this way some hundreds of small mines are enabled to run at a profit.

The capacity of the milling plants of many mines has been increased of late and there are now a number of mills having over 100 stamps, where formerly a 40-stamp mill was considered large. Shafts are being sunk deeper than formerly, and there is a general willingness to sink 1,000 ft. or more at once. In one district there are six shafts over 2,000 ft. deep and one nearly 3,000 ft. Of course this deep sinking requires a good equipment of machinery, and is costly.

There is an apparent demand in California for "going" gold mines, but less tendency to start development on prospects, so that the miners or discoverers have to do more work than formerly in order to close sales.

There is nothing especially new to be recorded in the mining situation for 1903 in California. Speculation in mining shares was light. Very few of the mines are listed on the stock exchanges or dealt in by the public generally; gold mining has become a business venture, like manufacturing. It is no longer the custom to put incompetent men in charge simply because they are relations or friends of directors; the superintendents are chosen for their fitness and experience. There is closer economy than formerly, and little or nothing is heard of extravagance, except in isolated cases where managers and directors are either unskilled or dishonest.

California is a very large State, covering 158,360 square miles. From the northwest and to the southeast corner the distance is 775 miles. The State is 148 miles across at the narrowest point and 235 miles at the widest. There are mountain ranges with peaks over 14,000 ft., and also valleys several hundred feet *below* sea-level. In so vast an area, with such diverse characteristics, it is natural to find a wide variety of mineral products. Greater attention is now paid to minor minerals; the great difficulty to contend with is usually the great distance of these deposits from market and the high freight rates still prevailing, which shut them from the centers of population in the East. It is for this reason alone that so many deposits of valuable mineral still lie untouched and undeveloped.

Nothing at all is being done with the iron ores, and it is only of late that much has been done with copper. Just at present there is a demand for quicksilver mines, and many new ones have been opened and brought to a producing stage in the past year. The output, however, exceeds the domestic demand, and much of the metal is exported and sold in competition with quicksilver from Spain and Austria for much less than home prices.

The quarrying interests of the State are becoming more important, owing to the improvement in the character of buildings erected in the larger cities of the Coast. Very much more sandstone and granite is being used. A comparatively new feature is the gem mining, carried on mainly in San Diego and San Bernardino counties, but also in Tulare. Tourmaline is the principal gem, but a product is also made of chrysophrase, turquoise and kunzite.

If the results of the work in the mines of the State for 1903 maintain the same ratio of increase as for several years past, then California should show for 1903 a total mineral output valued at about $36,500,000.

COLORADO.

By FORBES RICKARD.

No marked change in mining conditions in Colorado is to be noted for the year 1903. Statistics show a falling off in the output as compared with the previous year, which is to be expected in view of the plague of labor troubles which has been visited upon the State. The Cripple Creek and Telluride districts have been the main sufferers, and their mines are operating to-day under military protection. The Idaho Springs district has had its experience, and applied a remedy in no uncertain way.

Beyond general mine development work and an increase of mining facilities, comparatively little new work has been done throughout the State. A flurry of excitement came with the new camps of Bowerman (Gunnison county) and Sherrod (Lake county), but neither of these new finds has proved important.

Cripple Creek.—It is impossible to review mining in the Cripple Creek district for the year just closing without reference to a succession of strikes in metal mine, mill, smelter and coal mine; and the combination of any two of such difficulties would easily account for the falling off in its production and dividends.

The production of Cripple Creek compares with that of last year:

	Tons.	Value.
1902.....	629,954	$18,550,859
1903.....	500,000	14,000,000

The figures for 1903 are estimated after reference to mill and smelter returns available at this time.

There has been a decrease in dividends to the extent of $493,010; in 1902 the dividends were $2,334,472, while in 1903 they amounted to $1,841,462.

The most important work of the year was the starting and completing of the drainage 'tunnel,' or adit. The connection between the portal and the El Paso 600-ft. level was made September 6, and from that time until November 26 the water-level of the district sank eleven feet. After November 25 the flow increased, and about the middle of December the water was receding at the rate of six inches per day, or fifteen feet each month. The drainage tunnel has proved conclusively that all the mines of the district, except those of the east side, are connected by water channels. By the east side is meant the Isabella, Vindicator and Golden Cycle mines. The water gauge in the Gold Coin mine shows that the mines of Battle mountain will be affected as much as any of the other mines. This adit has cost between $80,000 and $90,000. As it was costing about $10,000 per vertical foot of depth to unwater the mines by pumping, it is readily seen that the adit has more than paid for itself. The eventual result will be to lower the water-level of the district 230 feet.

The only discovery of any note for the year was that of the Old Gold on Beacon hill, which proved to be the extension of the main vein of the El Paso, C. K. & N. Company. Shipments from this ore-body are averaging better than 2 oz. gold per ton.

The Portland Company's shipments for the month of December are expected to reach the figure of 10,500 tons. Irrespective of grade, this is the biggest shipment made at any time in the history of the camp.

The famous Independence mine continues to produce at the rate of 200 tons daily of low-grade ore. It is likely to maintain this output through the year 1904, and longer. This mine can show a record production reaching the creditable figure of $11,000,000 since its acquisition by the Stratton's Independence, Limited.

Leadville.—This district has shown much activity during the year 1903, and is putting out a big tonnage. Through extensive mill construction and the use of improved milling methods, Leadville is successfully coping with the low-grade problem, and shipments show an increase over last year.

This year's output has averaged about 50,000 tons monthly, of which the Colorado plants of the American Smelting & Refining Company have handled about 36,000 tons, divided among oxidized manganese-iron ore 15,000 tons, sulphide 13,000 tons and 8,000 tons of silicious oxides. The Salida independent smelter of the O. & C. Smelting Co. has taken care of about 5,000 tons of Leadville's production. The balance, or 9,000 tons remaining, consists of zinc ores and concentrates shipped to foreign points.

The new life taken on by some of the old mines on Fryer hill toward the close of 1902, has continued to be an interesting feature. In this part of Leadville there have been developed some enormous bodies of very clean sulphide ores, and good bodies of silicious oxidized ores; also some lead ore and silicious sulphides.

A new ore-body has been opened up in the Diamond mine in Big Evans gulch, which rewards the owners for their energetic persistence and money expended in dead work. The ore of this discovery is low-grade, but it carries 8 to 10 per cent iron excess, which makes it more marketable than it would otherwise be; and in this mine there occurs a streak of lead-carbonate ore carrying fair silver values.

The Yak Tunnel has developed a 60-ft ore-body of clean iron sulphide ore, and is making monthly shipments of 1,500 to 2,000 tons. Good shipments have been made during the year from the Ibex group on Breece Hill.

The Fortune, which adjoins the New Monarch, is opening an immense body of ore. The oxidized ores of the surface workings pass into silicious iron sulphides as depth is gained, which is, of course, typical of a great many of Leadville's mines.

The down-town mines have been producing a large quantity of iron ore and holding up well. The Iron-Silver Company produces from 300 to 350 tons per day, divided between iron-copper sulphide and zinc sulphides.

The mills of the A. Y. & M. and A. M. W. are doing clean work and turning out good quantity of concentrates. The A. Y. & M. is producing monthly about 1,000 tons iron-lead concentrates and as much more zinc concentrates, besides some 2,000 tons of crude ore. The A. M. W. is making a mill product of 400 tons of lead ore and 900 to 1,000 tons of zinc concentrates.

Aspen.—The camp of Aspen is producing monthly 9,000 tons to 10,000 tons of silver ore of a grade ranging from $8 to $20 per ton. The production totals $1,570,000, exclusive of mill yield. These ores are high in lime, and carry some lead.

The main productive properties are those of the Percy LaSalle and the Durant companies. The Smuggler and Cowenhoven tunnel properties are doing their share.

The output of the LaSalle Company's mines reaches 2,500 to 3,000 tons monthly.

The Smuggler is now putting out about 1,000 tons

monthly, but has been shipping more extensively. Some of the workings of this mine have been on fire for a long while.

Creede.—Shipments from Creede amount to 150 tons of crude ore daily.

The Big Kanawha Leasing Company, which has been hindered of late by lack of coal, will add to the production about 30 tons daily in lead and zinc concentrates.

Silverton.—Silverton is doing very well. This camp is shipping monthly 3,000 tons. The principal producers are the Silver Lake and Sunnyside Extension. Recent developments in the Silver Lake property are reported to be very satisfactory. There has been opened up in this mine a very good grade of concentrating ore, and the mill product is of a better grade and quality than it has been in the history of the new ownership. The Gold King mine is said to be developing most satisfactorily.

An important discovery has been reported from the North Star mine on Sultan mountain, just behind the town of Silverton.

Telluride.—Uncertainty of labor conditions during 1903 has retarded development in this district, and has operated adversely to its mining interests generally.

At this time the Tomboy is about the only mine that is making any considerable shipments from the district of Telluride. The Argentine vein of this company is proving to be one of the richest lodes in Colorado. The Smuggler-Union and Liberty Bell groups have been idle for some time, but are now starting up under military guard.

The Butterfly-Terrible mines, at Ophir, are again in operation and shipping.

Ouray.—The Camp Bird mines maintain a steady production, and developments continue to be highly satisfactory. Shortage of water, due to a peculiarly open winter, necessitated the recent closing of the mills, but the shut-down was only of a few days' duration.

Clear Creek.—This section has been making good progress during the year and is maintaining its usual steady production.

In Upper Clear Creek the Terrible, Dives-Pelican and Seven-Thirty mines have been the regular shippers, and the close of 1903 notes the development of an important ore-body in the west end of the sixth level of the Centennial mine, which lies within the city limits of Georgetown.

The Sunburst lease of the Red Oaks company is also making good shipments.

The Doric-Griffiths consolidation promises to be a factor in the production of the near future.

The famous Joe Reynolds group at Lawson is in good pay again, their deep 'tunnel' is completed, and from it a rich silver ore-streak is being mined.

In lower Clear Creek the Gem Extension and Sun & Moon groups have made the best showing for the year. In raising for connection with their main shaft through the Newhouse tunnel, developments in the Gem Extension have shown up well, and this company is making an addition to their mill, remodeling the older part of the mill, and getting ready for production on a much more extensive scale in the year 1904. The Sun & Moon group was set back by the strike, and will be remembered as the scene of violence and dastardly attack.

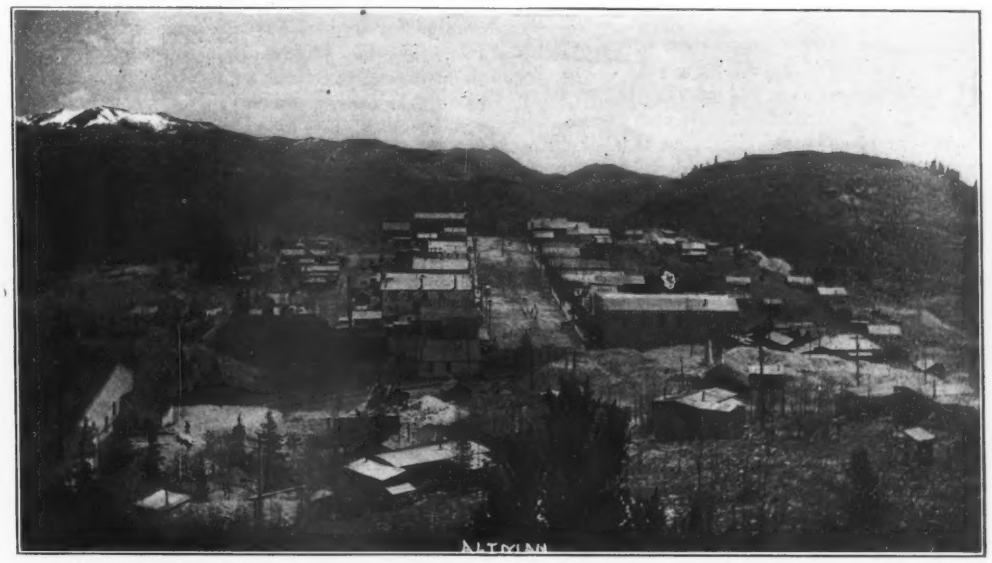
Though handling custom ore, the Newhouse tunnel has not been advanced in two years past. This great enterprise is likely to take on new life in the coming year, when arrangements are completed with the owners of the Saratoga mine, in Russell gulch, Gilpin county, to tap that vein in depth. The distance now lacking is a little more than 1,000 ft. The contract for this work is being negotiated, and the Saratoga mine has pulled its big Cornish pump in anticipation of a favorable agreement.

The Gum Tree mine is opening up rich lead ore carrying copper values.

The Stanley Consolidated has adjusted its difficulties, and will, in the early part of the year, no doubt, be found in the front rank of the producing mines of the district.

Gilpin.—This part of the State has been pegging along much as usual, and can always be depended upon for its contribution.

The Old Town Mining Company and the Running Lode (Gower Mines Syndicate) have taken the lead in the past year. The Running Lode production takes the form of a high-grade silver-lead ore, containing gold also. During the year it returned dividends amounting to more than 100 per cent on its capital stock. The output of the Old Town mines, while of lower grade than the Running Lode, probably tops it in the aggregate.



ALTMAN, THE HIGHEST MINING CAMP IN COLORADO.

INDEPENDENCE MINE, CRIPPLE CREEK.

The Kansas Burroughs group, now being operated mainly through the leasing system, has been making a production ranging from 1,500 tons to 2,000 tons monthly in milling and smelting ores. Regular dividends have been earned by the Town Topics Company, working the East Notaway lode, in Russell gulch. This vein yields a high-grade gold-copper ore, and has in the past produced some rich telluride mineral.

The Specie Payment mine has done well in the past year, as also the Delmonico.

The Saratoga mine is awaiting the extension of the Newhouse tunnel. This mine has been the main dependence of, and is under the same ownership as, the smelter at Golden. The smelter has been shut down for some months.

Many of the mines of this district have been hindered by coal shortage at the close of the year.

Of the enterprises that point toward increasing activity and progress in Gilpin county, that of the Buell Consolidated is perhaps the most important. This company has just completed a modern and up-to-date mill, and is steadily augmenting its shipments, so that the close of 1904 is likely to see it attaining a more prominent place among the productive mines of the camp.

General.—Taking it all round, the close of this year sees the San Juan region of Colorado making the better progress and the best improvements. Leadville is doing close work, but there is nothing elastic about its present production, nor does it give promise of any change in the coming year. Nothing short of another Little Johnny is required to bring up the grade of the immense tonnage of low-grade fluxing ore produced by the Leadville district.

Aspen is plugging along faithfully, but it must be considered as a district of declining activity.

Cripple Creek continues easily the premier mining district of the State, and from Cripple Creek we may look for something better than the story of 1903, with its chapters of strikes, strife, turmoil and coal shortage. These things combined have in-

deed 'crippled' mining in the whole region, both in respect to the search for new ore-bodies, as well as in the development of established mines. It has had this effect temporarily, but temporarily only. The indomitable energy and ability that has created this great mining camp will not be denied.

CRIPPLE CREEK.

BY AN OCCASIONAL CORRESPONDENT.

Pleasant as it would be to chronicle a big gold output from the Cripple Creek district, it is improbable that any reliable figure for the year ending will give a value greater than $14,500,000. If this figure be accepted, the reduction over last year's production is not far from $4,000,000. Inasmuch as labor differences and the water problem, rather than mineral failures, are responsible, there is little inclination to make excuses for the shrinkage. In spite of the curtailment some substantial dividends were paid. The list, which does not include a number of leasing concerns, follows:

Stratton's Independence	$375,000
Portland	360,000
Strong	300,000
Golden Cycle	247,500
Vindicator	176,000
Mary McKinney	90,000
El Paso	61,250
Last Dollar	60,000
C. K. & N.	57,276
United Gold Mines	40,097
Practical	30,000
Pinto	10,000
Acacia	14,339
Modoc	20,000
Total	$1,841,462
Total dividends to date	$32,876,660

As compared to the situation prior to the strike, 500 less men are employed. Previous to August 10, when the Western Federation of Miners ordered a cessation of operations, about 4,300 miners, mill-men, ore and coal-haulers were at work. To-day there are about 3,800, of which less than 1,000 are on unionized mines and those where their affiliations are not questioned, and the remainder on mines or other plants where lines have been strictly drawn against the miners' union. Of the former class, chief are the Portland, Free Coinage, Anaconda and Le Claire, while nearly all others of importance may be included in the latter. At several properties, notably the American Eagles and others of the Stratton estate; the Wild Horse of the United Gold Mines Company; the Hull City, of the Independence Consolidated; the Isabella, the Dead Pine, and the Carbonate Queen, no work is being done, partly because of the strike in some cases and for physicial reasons in others. On the whole, the situation is clearing rapidly, and within another month production will doubtless approach the normal. In fact, several of the Battle mountain properties broke records during December, several other hills made the usual output, and more are daily adding to their tonnage. Of the loss by the strike, few observers agree. In production it was probably $4,000,000, but the effect was so far-reaching in mercantile lines, owing partly to the departure of debtors, that these figures may be enlarged considerably. While having almost as much patronage as before, merchants declare they will hardly be ready to celebrate until July 4.

One of the greatest reliefs brought to Cripple Creek operators is the El Paso drainage 'tunnel' which has pierced Beacon hill for several thousand feet. It has cut a number of channels that are pouring water through the portal at the rate of 6,000 gal. or more per minute and lowering the level in several mines at the rate of 10 ft. a month. Meanwhile the northeast heading is advancing on Requa gulch and Raven hill, in which direction it is believed a flow of water will be encountered that will drive the miners from the breast. Early beneficiaries of the adit's advance are the El Paso and others on Beacon hill, the Gold King, Moon-Anchor and others on Gold hill, the Mary McKinney, Elkton and others on Raven hill, the Gold Coin and others on Battle mountain, and the Last Dollar and many others on Bull hill. At several of these mines a return to the drifts submerged for two years or longer will soon be possible, while in some of them sinking may be resumed in a few months, according to the position and depth of the workings. It is claimed that the eastern extremity of Bull hill, where are the Vindicator, Golden Cycle and Lillie, will not be relieved. The opening of another channel may disprove such theories. Formerly it cost $2,500 per vertical foot to discharge the water of the Elkton mine, taking no account of the outlay for apparatus. However, this mine drained several others. With pumps in operation at four mines the discharge cost $10,000 per foot. The El Paso tunnel has cost $75,000 to date. In one month of drainage the cost of pumping, it may be seen, is heavily discounted.

So well satisfied are operators with this achievement that the drilling of another adit has been suggested. It would be possible to drain the field 700 ft. deeper by driving a considerably greater distance. Such discussion is regarded as premature, however, in view of a proposition to sink 300 ft. in the 'tunnel' and pump under a joint financial arrangement. It may be a long time before such a step is necessary, as the depth of the bore equals that of the Elkton and the El Paso's shafts and two years may elapse, according to experience with the Standard, before the 'tunnel' runs dry.

TRAMWAY AND POWER PLANT IN WYOMING.

Important advances were made during the year in treatment. The success of home plants employing the cyanide process was demonstrated, and a further cut made in the grade of ores that may be shipped and profitably treated at valley mills. While there were failures in experimental plants at Cripple Creek, they were mainly confined to those where reduction of sulphide ores was attempted by cyanide and without roasting. Treatment of oxidized material, of which there are vast quantities on Globe and Ironclad hills and Copper mountain, was, in the main, attended by satisfactory results.

Two or three years ago complaint was heard, from those who shipped $18 or $20 ore, of the small margins left after expenses and royalties were paid. This material was sulphide ore, and was treated at the valley mills. To-day profits are obtained from $8 and $10 ore, upon which charges for transportation and treatment have been reduced to $5.75, under certain contracts. It does not pay to mine $8 ore, but after it is hoisted, generally with some ore of better grade, there is more money in shipping than in throwing it over the dump. Where the body is large, $10 ore may be mined and shipped at a profit, say from $1 to $2, if no royalty is due. As there is much material of this quality, in the ground and on the dumps, considerable revenue is likely to accrue when facilities are improved for moving it from the mines.

No important increase in production has resulted from the leasing of the Stratton estate, which began early last summer. Only that part of the property lying on Gold and Globe hills has been assigned, and as little of the ground, aside from that included in the Abe Lincoln group, had been developed to the point of productiveness, it is early to expect shipments. However, some successful explorations are being carried out. The production of the Abe Lincoln is about 1,400 tons a month. It is generally believed that a prospect of sale is responsible for the failure to lease the Bull hill territory, although nothing definite on either subject can be obtained from the directors.

Most of the large mines have made fairly good records during the year, considering the circumstances. The Portland and the Golden Cycle have probably made the best showing. The Isabella has not been worked, except by a few lessees, since it was shut down in the early part of March. The consolidation of this property with that of the Empire State Consolidated Company has been consummated. Stratton's Independence, Ltd., has declared two dividends, aggregating $375,000, and still has a large treasury reserve. The Woods Investment properties have not been as productive as heretofore. The litigation over the will of the late W. S. Stratton has been settled. The dividend record for the year has not been bad, though no remarkable showing has been made. Very few new enterprises have been started; the production, of course, has been greatly reduced, but with the cessation of labor troubles the future of the district will be much brightened.

The special work of the United States Geological Survey, in co-operation with the State, has been in charge of Mr. Waldemar Lindgren, geologist, who has had the assistance of Messrs. F. L. Ransome, S. C. Graton and A. M. Rock. A large portion of the field-work has been completed, and the remainder will be completed upon Mr. Lindgren's return from Australia in January, so that it is hoped the report will soon be ready.

WYOMING MINES.

BY H. C. BEELER.

The year 1903 has been marked by a great general activity in all the camps of this State, and more actual development has been accomplished than in any previous period in the history of Wyoming.

In the Grand Encampment copper district, in southern Wyoming, the North American Copper Company, owning the Ferris-Haggarty mine at Dillon, the Encampment aërial tramway and smelter, has been doing development work only in the Ferris-Haggarty mine, and now has 280,000 tons of 6 to 8 per cent copper ore, with small gold and silver values, blocked out and ready for stoping, in addition to enlarging and reorganizing the underground haulage system and installing complete surface works, compressors, power and light plant, etc., at the mouth of their main adit.

The tramway from the Ferris-Haggarty mine to the Encampment smelter, a distance of 16 miles, has been in daily commission, and has proved generally satisfactory, although some changes, such as placing new towers, tension stations, etc., at points required by experience in snow, winds and other local conditions, are in progress.

At the Encampment smelter the equipment has been enlarged to a capacity of 500 tons per day; a concentrating, roasting and briquetting plant has been added, and converters installed to produce blister copper, instead of shipping a 50 per cent matte, as heretofore. Some changes were necessary in the arrangements of this machinery, but the trials already made are considered satisfactory by the management.

At the Doane-Rambler mine, on Battle creek, a new drainage and development adit has been extended and a cross-cut driven under the main shaft, which will be equipped with hoist, etc., and sinking resumed. Some stringers of high-grade copper-glance and black oxides were cut during the above work and sacked for shipment. This company has also erected extensive surface works, compressors and power-plant, and is now prepared to push systematic development. Seventy men will be put to work at the beginning of the year, and operations will be carried forward with energy.

Throughout the Encampment district, work has been carried on this year with increased facilities, some 50 steam-hoists being in place at the most prominent properties, so that the season's results exhibit a great deal of progress in the permanent development of the mines.

Along the Wyoming-Colorado line, near Pearl, south of Encampment, this progress has been especially marked, and a number of the prospects of a year ago are now in a position to maintain a steady output as soon as transportation can be secured.

The New Rambler, east of Encampment, shipped some high-grade ore and matte from a small smelter during the first part of the year, but this mine has been shut down recently, pending the adjustment of the company's affairs. The American Mining Company, near the Rambler, has installed a plant suitable for deep mining, and is steadily sinking a three-compartment shaft.

At Silver Crown, Slate creek and other camps in the Laramie hills, work has been steady throughout the year, with tangible results. North of Laramie peak, five new plants are in operation, where last year nothing was done.

The South Pass gold district, in Fremont county, has been more active than usual, the Dexter Mining & Development Company's work at the Tabor Grand, Rose and Dexter cross-cut tunnel at Atlantic being of permanent value; the Carissa, at South Pass, has been running steadily on development work without stoping. At Lewiston, the Strawberry, Burr and other properties have changed hands, and are in steady operation. These properties were thoroughly examined and numerous tests have been made on carload lots, so that the successful treatment of these ores seems now assured. Heretofore attempts to mill the ores of the South Pass district have not been very successful, the stamp-mill having been the most popular method, but with a low extraction. Cyanidation, when adapted to the needs of the various ores, gives apparently the most satisfactory result.

In the northrn part of the State mines are being opened up at Kirwin, on Wood river, and at Sunlight, north of Cody; at Copper mountain, near Thermopolis; on the south fork of the Stinking Water river, and in many cases the results are said to be most encouraging.

In general, through the State, prospecting is more active than ever before, and a number of good camps are being quietly developed with little fuss or advertising. Lack of transportation is the main obstacle in the opening up of the State's camp, and until this is provided, but little advance can be made.

Phenocryst is from the Greek—*phaino*, show, and *krystallos*, crystal. The latter comes from *kryos*, frost.

MONTANA.

By Wm. A. Akers.

While the prosperity of Butte, the largest camp in the State, has been interrupted by two serious shut-downs, mining throughout Montana generally has been more active during the year than at any time in its past history. Several of the older districts have been revived, and a number of new camps also have been added to the list of producers.

On July 1 the Washoe smelter, at Anaconda, was closed so as to permit of finishing and connecting the new flue and stack, the flue being 2,300 ft. long, the upper 1,000 ft. being 120 ft. wide by 37 ft. deep, and the lower 300 ft., 60 ft. wide by 37 ft. deep, and the stack having a diameter of 30 ft and a height of 300 ft. The mines of the Anaconda, Parrot and Washoe companies, situated at Butte, were closed down while this was being accomplished, operations in them and at the smelter being resumed on September 15.

As the result of an action brought by John MacGinniss against the Boston & Montana Company, Judge Clancy granted a temporary injunction on July 23, 1901, to prevent the Amalgamated Company from receiving dividends upon or voting the shares of the Boston & Montana. A similar action having been brought by John MacGinniss and Daniel Lamm against the Parrot Company, by agreement of counsel the decision in the case against the Boston & Montana was to apply to both.

On the morning of October 22, 1903, Judge Clancy rendered a decision making the temporary injunction permanent, and stating that while he would not at that time make any appointment, he would hold in abeyance the question of the appointment of a receiver for that company.

As a result of this decision the mines of the allied companies, comprising the Anaconda Copper Mining Company, Boston & Montana, Butte & Boston, Colorado Smelting & Mining, Parrot and Washoe were closed that evening, and the reduction plants at Anaconda, Great Falls and Butte ceased operations a few days later. On the afternoon of November 11, Governor Toole called a special session of the legislature to enact the necessary laws to secure justice for litigants in Montana, and all the closed mines resumed operations the evening of the same day.

Copper.—The four plants of the allied companies, namely the Washoe, at Anaconda, the Boston & Montana, at Great Falls, and the Butte & Boston and the Colorado, at Butte, have been treating 9,500 tons of ore per day, except during the suspension of operations mentioned in the preceding paragraph. Only three of the shafts of these companies have been sunk deeper during the year: the Anaconda, 142 ft., the Parrot, 200 ft., and the Clear Grit, 300 ft. The Anaconda, Parrot and Washoe companies have completed a central pumping station on the 2,200 ft. level of the High Ore mine from which the water is raised 1,900 ft. to the surface-tunnel, 300 ft. below the collar of the shaft, in three lifts. The equipment is in duplicate. The Boston & Montana Company has installed a Nordberg pump on the 1,200-ft. level of the Leonard mine which raises the water in one lift to the surface. Into this level is drained the water from its other mines, the Pennsylvania, Mountain View, East Colusa and West Colusa, making a flow of 500 gal. per minute, or about half the capacity of the pump. Mr. D. W. Brunton, consulting engineer for the allied companies, has designed and erected a large timber-framing plant at Rocker for mechanically framing round timbers for square-setting in the mines of these companies. It is kept running to full capacity, but in addition to the round timbers these companies have used 53,000,000 ft. of sawed timber during the year.

At the Butte Reduction Works, owned by Senator W. A. Clark, a number of improvements have been made in the concentrator and a new furnace has been built. The plant has been running continuously to its full capacity, treating the ores of Senator Clark's mines, the Original, East Stewart and West Stewart. At the West Stewart and at the Original, 36 by 72 in. double, first-motion, round-rope Nordberg hoisting engines have been installed and steel head-frames erected, the one at the Original having a height of 126 ft. from the collar of the shaft to the center of the sheave, being the highest in the camp. Skips are used.

The United Copper Company has increased the capacity of its concentrator at Basin from 900 tons to a maximum of 1,500 tons daily, and is treating an average of 1,300 tons daily, shipping the concentrates back to Butte to its smelter. The following are the operating mines of this company with the depths of shafts and approximate daily output: Minnie Healey, 1,150 ft., 500 to 800 tons; Corra-Rock Island, 1,400 ft., 400 tons; Rarus, 1,450 ft., 1,000 to 1,500 tons; Belmont, sinking from the 700 to the 800 ft. levels, and not producing. The copper values in the Corra have been leached out to the depth of from 800 to 1,000 ft. below the surface, but on the 1,200 ft. level a large body of high grade glance has been developed. The Minnie Healey was closed by injunction July 1, at which time the Supreme Court ordered a re-trial and work was resumed.

The Pittsburg & Montana Mining Company has been pushing the development work underground and erecting its smelting plant with all possible expedition. One furnace is completed and the track from the north shaft to the smelter is finished. Everything is being done in the most substantial manner. This company recently purchased some mines at Elkhorn which are producers of heavy pyrite ores, and is now developing them.

The injunction which kept the Speculator mine closed during the last half of 1902 was removed, and it has resumed operations on a large scale.

In Beaverhead county the Indian Queen has been operating very successfully on its large bodies of glance and chalcopyrite, and is enlarging the smelter. The Copper Cliff has developed very satisfactorily and a concentrator for its ores is building.

In Jefferson county, Bird, McCabe and King have acquired, by location and purchase, 175 claims and 320 acres of ranch land in the Corbin district, and are sinking three two-compartment shafts upon them. Chalcopyrite and bornite are found at the surface.

Gold.—The extension of the Montana Railroad from Harlowton to Lewistown has stimulated the operation of the large gold deposits of Fergus county. The Kendall property and the Barnes-King group, in the North Moccasin mountains, are operating their large cyanide plants, the former treating 350 tons and the latter 240 tons daily. Development in both these properties has been very encouraging.

The Gold Reef Mining Company, at Gilt Edge, is operating its large mill with very satisfactory results. Several smaller plants are being operated with success in this district. On the Big Six group, in Whiskey gulch, near Gilt Edge, 70 men are employed blocking out ore, and a large cyanide plant is to be constructed.

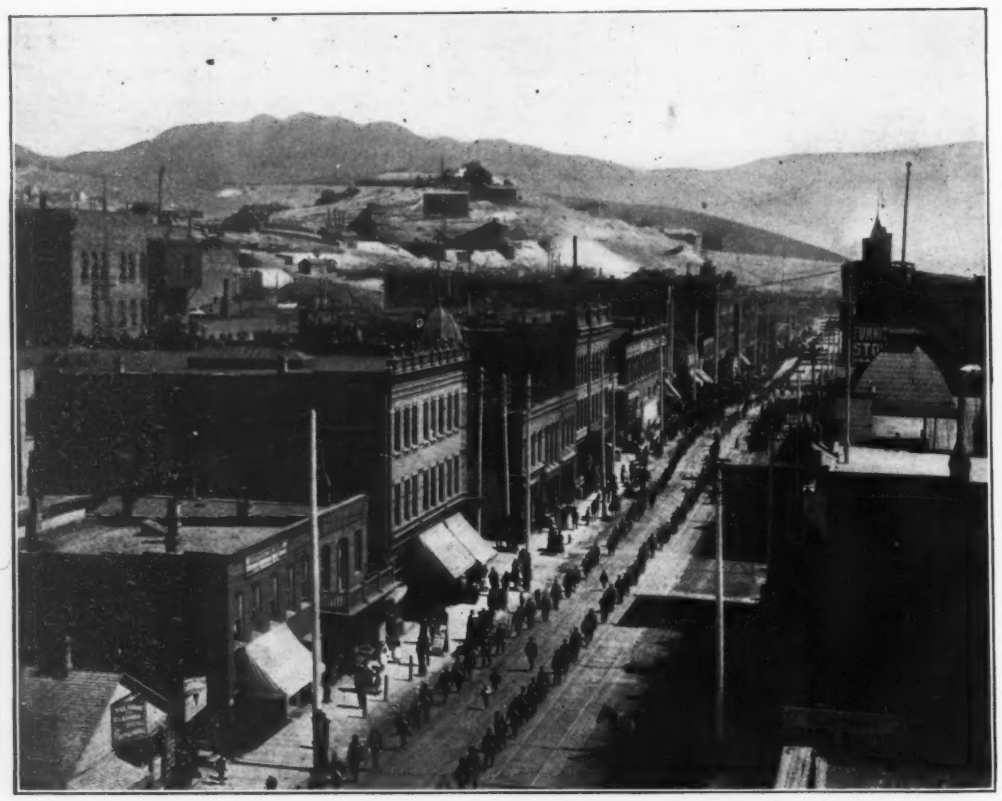
In the Marysville district, the Drumlummon mine, owned by the Montana Mining Company, Ltd., is operating its 40-stamp mill, and during the summer successfully cyanided a large tonnage of slimes remaining from accumulated tailings. During the last six years it has treated by cyanide about half a million tons of tailings. The group comprises a large number of claims, and development work is being energetically prosecuted above the 400-ft. level, or 'deep tunnel' level, north and south of the old workings. The Bald Butte mine, in the same district, has not been operating its mill during the latter half of the year, development work only being done.

Near Helena the Big Indian Gold Mining Company has been operating its 60-stamp mill with very satisfactory results.

A. C. Burrage, who was operating the Clipper and Boss Tweed mines, at Pony, in Madison county, has discontinued work and has leased the mines to

W. W. Morris. The Kearsarge, eight miles from Virginia City, has absorbed the old Kennett property, and is moving the 60-stamp mill from the Kennett to the Kearsarge. It has been shipping, operating an old five-stamp mill and blocking out its reserves. The U. S. Grant, near the Kearsarge, is erecting a mill. The Revenue-Monitor, at Norris, is installing a cyanide plant. The Watseka Gold Mining Company, at Rochester, has opened its mine to the 600-ft. level and has over 10,000 ft. of drifts, of which 3,000 ft. have been run during the year. It is the wettest mine in the State, having a normal flow of from 650 to 700 gal. of water per minute, all of which has to be pumped to the surface. A force of 160 men is employed. The old mill, having a capacity of 40 tons daily, and employing cyanide, amalgamation and concentration, was run until August. The new mill, daily capacity 150 tons, was completed July 1, and has put through 13,000 tons.

In Deer Lodge county the old Cable mine, which has produced more phenomenally rich gold ore than any property in the Northwest, but which was regarded as worked out, has been operated very successfully during the year by a Butte syndicate, of



GENERAL VIEW OF BUTTE—PARROT AND ANACONDA MINES IN BACKGROUND.

which Mr. F. W. Bacorn is at the head. The 20-stamp mill has been run a good portion of the time, and a part of the resultant profit applied to energetic and systematic development. In the Gold Coin, two miles from Cable, a rich strike has just been made and some truly magnificent specimens secured. The extent of the strike is not yet determined, but the specimens exhibited contain several thousand dollars in visible gold. The old Southern Cross, near Cable, which has been idle for a number of years, is under lease and bond to Mr. Lucien Eaves, who has been shipping considerable tonnage to Anaconda by wagon, a distance of 17 miles, and who is now erecting a cyanide plant. Large bodies of ore are developed. A 10-stamp mill is going up on the Amazon property.

The Kimberly-Montana Gold Mining Company, in Bear gulch, Park county, is operating successfully, and has just completed a 40-stamp mill.

The Ajax mine, at the head of Big Hole Basin, after operating its five-stamp mill successfully for a year, is installing a tramway and ten additional stamps.

The Jay Gould, in Lewis & Clark county, one of the productive mines of Montana's early days, is being equipped with a cyanide plant, after years of idleness.

In Flathead county a large amount of encouraging development has been done on the free-gold veins of the West Fisher district, while in the Libby district several properties are showing up handsomely.

The Snow Shoe Mining Company is doing extensive work on a large concentrating proposition, having values in gold, silver and lead.

Jefferson county has been the scene of much mining activity, and the Penyan, Blue Bird, Ada, East Pacific, Bertha, Eva May and Liverpool are among the list of producers. On the Bullion properties, ten miles from Basin, M. L. Hewitt is erecting a smelter.

Gold Dredging.—Five dredges have been in successful operation during the season, three near Laurin, working on the old Alder gulch placers, one in French gulch, 20 miles west of Anaconda, and one operating four miles below Bannock. At one time there were five boats on Grasshopper creek, in the Bannock district, but four of them have worked out their ground. They secured nearly a million dollars from this abandoned placer.

Silver.—The Granite-Bi-Metallic property has been operated on a large scale during the year, until the latter part of July by Mr. Paul A. Fusz as manager, from then until December 1 by him as receiver, and during December by the same gentleman as manager once more.

The old Hope Mining Company, which built the first silver mill in Montana, has changed its name to the Good Hope Mining Company, and is being operated by the Granite-Bi-Metallic Company. In Walkerville a considerable tonnage of silver ores is being extracted by lessees and some rich strikes have been made. C. W. Ellingwood, who has been leasing on the Goldsmith for the past six years, has shipped $75,000 during the last three months.

At Saltese much activity has been displayed during the past year, and developments have been very gratifying. A large body of high-grade ore has been developed on the 400-ft. level of the Tarbox.

Coal.—The Horr and Red Lodge mines are being extensively worked, as are also the mines of the Anaconda Company at Belt. The Washoe Company's mines at Storrs are the most largely developed of any in the State, and have at present 100 coke ovens in operation and 100 more building.

UTAH.

By Jas. W. Neill.

The leading mining districts of Utah exhibit healthy progress during 1903, as the following account will indicate:

Park City is primarily a silver-lead camp, and its output goes to the smelting works of the American Smelting & Refining Company. This district has prospered during the year 1903, partly owing to the enhanced price of silver and lead and partly owing to the large amount of outside money spent in development.

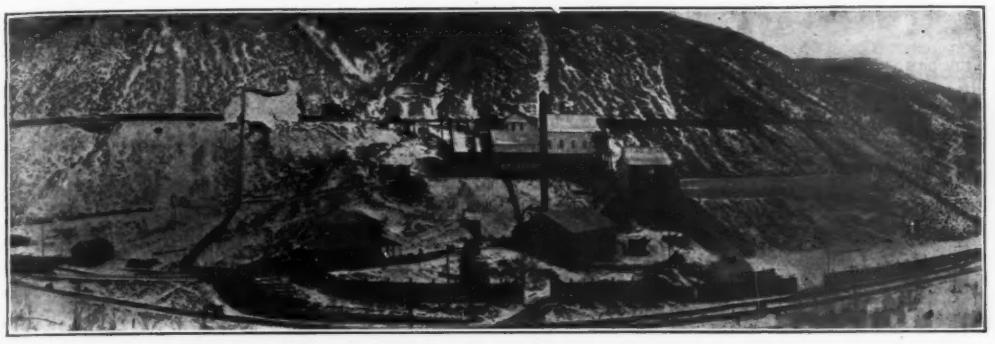
The Silver King and the Daly-West mines are the leaders, each has shipped about the same amount of ore (75,000 tons), and each has paid about $1,300,000 in dividends; each, also, has maintained its reserve of both money in treasury and ore in sight.

Improvements in the surface plants of these two mines are not of material moment; each keeps pace with the times and with the demands of its output. The Daly-Judge, which started the year with a mill of moderate size, has increased the capacity during the year and maintained regular shipments of concentrates. The destruction of the separating plant which handled the zinky middlings curtailed this output and terminated efforts to make Park City a zinc-producing camp. The development of the Bonanza flat portion of the Daly-Judge ground has progressed favorably and some rich ores have been encountered. It takes time to make a mine, but this ground should soon make important shipments. The Ontario is now building a concentrating mill, in which to handle the large tonnages of low-grade base ores long held in reserve. The shipments have not been heavy from this property, but quite a little money is said to have been earned through excavations beneath the old mill, where it has been found that the quicksilver from the amalgamation process had penetrated the earth to a surprising depth. The Comstock has erected a concentrating mill, as has the Keith-Kearns mine, and both these properties will join the ranks of producers in 1904.

Of the many companies floated in 1903 there are a number which, from present information, will be producers in the near future, such as the Naildriver, St. Louis Vassar, Scottish Chief, Keystone, and New York.

Bingham has had a good year. The Highland Boy mine of the Utah Consolidated has kept up its steady work, added to its reserves a new intermediate orebody of high grade, commenced the construction of important enlargements to the smelter, and has been the largest producer of copper in the State; with an output of about 13,250,000 lb. during 1904, the new part of the plant will enable this property to produce, from an additional 250 tons of ore, about 7,500,000 lb. more, so that this mine in 1904 should yield close to 20,000,000 lb. of copper. The mine, it is said, has never looked so well, and the entire plant is a model of business-like management which appeals to every visitor. The Bingham Consolidated has succeeded in unwatering its Dalton and Lark mines, and these are responding to development in a very satisfactory way; the Commercial is a regular shipper, and the smelting plant in the valley has been operating with its usual clock-work precision. This company has produced during the year between 8,000,000 and 9,000,000 lb. of copper bullion, and, as this plant has a blast-furnace process and handles a great deal of silicious ore, the bullion product is of much greater value than that of the Highland Boy. These silicious ores have been purchased from the mines at Tintic and other camps, at prices leaving a good profit to the shippers; the Bingham Company, however, has recently purchased a control of the Eagle & Blue Bell mine in Tintic, and with this in their own hands the company will be in a more independent position. Everything looks prosperous for the Bingham companies, and their output will be materially greater in 1904 than in 1903. The United States Mining Company has been a regular producer during the year, the mines have supplied the wants of the smelter, and this has been operated

steadily and successfully throughout. For a period the shipments from the Centennial Eureka of this company were shut off by a fire in the neighboring mines, but this did not interfere with the production. Developments in the United States mines have kept pace with production, and the reserves are said to be greater now than at any period in the history of the company. The directors are considering the erection of a lead-smelting plant, in addition to the copper furnaces. This company produced about 8,000,000 lb. of bullion, and this is the highest in grade of any sent from the State. The Boston Consolidated Company has begun an era of production by shipping to the United States and Bingham smelters a small tonnage of ore; this has been of such good grade as to remind one of the first shipments from the Highland Boy. The Copper Belt Railway is now completed to the ore-bins of the Boston Consolidated, so that regular and large shipments will now be made to the valley plants; meanwhile the best process and appliances are being studied with a view to erecting a smelting plant. The ore-bodies in the Boston Consolidated are of such magnitude that these shipments will practically come from development; indeed, those best informed compare the Boston with the Highland Boy, and congratulate the camp on having two such mines. Close to both these mines in Carr Fork is the Yampa of the Tintic Mining & Development Company. Here the year has been given to opening up the ore-bodies, shipments from development work only being made; these have shown the values to be like its neighbors the Highland Boy and Boston Consolidated, and of such grade as to pay well even when shipped to outside smelters. This company has now completed, in the main cañon a short distance below the town of Bingham, a smelting plant of 250 tons daily capacity, equipped, however, with power, dust flues, stack, bins, etc., for double that tonnage. This plant will be started up before the new year, and thus another considerable tonnage will be forthcoming. The shipments from the Yampa smelter will be in the form of matte and will go to one of the valley plants to be reduced to copper, but the total metal output of this mine should be not less than between 6,000,000 or 7,000,000 lb. for the year 1904. A photograph of the Yampa plant is given herewith. The enormous deposit of concentrating porphyry mentioned in my review a year ago has been acquired by the Utah Copper Company, and they have a mill of 500 tons daily capacity now well on the way to completion. This mill is situated about 1½ miles below the town, at a point where abundant water can be had from bed-rock; to this point the ore will be hauled by railroad. This mill is considered by the builders only in the light of a demonstration, and, if the returns are as expected, they will proceed to erect a plant to handle 2,000 tons daily; they will then doubtless also go into the smelting part of the business, but at first they will be shippers of concentrates carrying about 25 per cent copper.

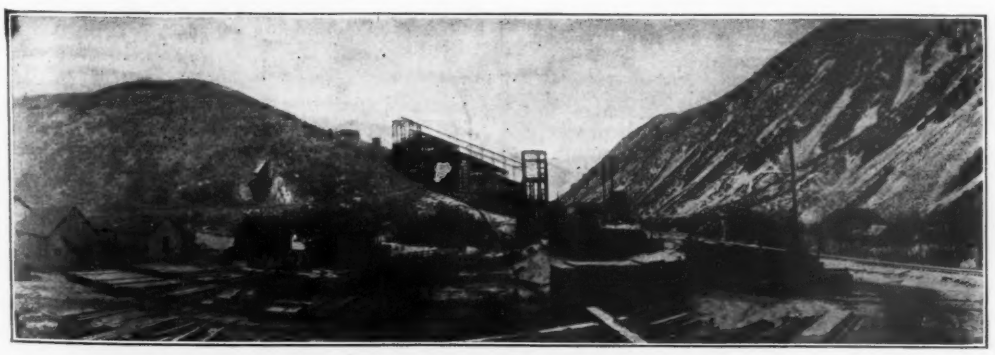


YAMPA SMELTER, GENERAL VIEW.

This 500-ton mill should be in operation in April, and thereafter should add to the metal output at the rate of about 5,000,000 lb. per annum. The outcome of this venture is of the greatest importance to the copper production of the district and of the State, as the quantity of the material available is very great.

Close to the Utah Copper Company's ground is the Columbia mine, which has lately been acquired by the Ohio Copper Company; this company is now re-equipping one of the old concentrating mills and will soon start out with a production of over 100 tons per day, the ore averaging about 5 per cent. Besides this, they ship a considerable quantity of higher grade ore to the smelters. The property is capable of producing an enormous tonnage of low grade material similar to the Utah Copper Company, and when the latter demonstrates that there is a profit in this material we can look for the erection of a much larger plant for the Ohio Copper Company. Prospecting and development is going on all around the leading mines, and there are many good indications of more producers developing during 1904. These properties in Bingham, as described, promise to yield from their own and, in some part, from Tintic ores also, close to 60,000,000 lb. of copper per annum, an amount which will obtain the attention of the market.

YAMPA SMELTER AND SURROUNDINGS.



CONCENTRATOR, UTAH COPPER COMPANY.

Tintic.—This large district, embracing the camps of Eureka, Mammoth, Robinson, Silver City, and Knightsville, has come to the front again, doubling its shipments over last year. The increase is due largely to the big output from the Centennial Eureka of the United States Mining Company, and from the dumps of the Grand Central mines, as also from the iron mine of the Dragon and Black Jack. About 175,000 tons, in all, have gone to the valley smelters. The reduction works in the camp are all closed down, but the May Day and the Uncle Sam have both built small concentrating plants to handle low-grade ores, and it is rumored that a large plant for the re-working of the Mammoth tailings will be erected during the year. The Centennial Eureka is the largest shipper in point of tons and in value of product, and the mine is said to be improving with depth. The Gemini has been a large shipper of high-grade silver-lead ores to the American Smelting & Refining Company, and this mine has reached the lowest level in the camp and has there found the ores changed to sulphides, but of better grade, an excellent promise for the future of the camp. The revival of the eastern end of the district at the Yankee, the Godiva, Uncle Sam, and Tetro, is of importance, and in most of these properties the ore-shoots which formerly appeared only to be superficial now seem to continue downward. The Tetro became a new shipper during 1903, and promises well for 1904. The Bullion Beck, Mammoth, Ajax, Sioux mines, and the Swanseas at Silver City, are dormant; on the other hand, the Grand Central has found ore-bodies in new ground and is looking particularly well. Fluxing iron for the American Smelting & Refining Company has gone out in large volume from the Dragon and the Black Jack. This carries an excess of about 53 per cent iron, but contains no precious metals.

Mercur.—It may be said that the Mercur is about the only camp where we must note retrogression; the old reliable Mercur Consolidated is still working, has installed a slime plant and is still taking out ore in large quantity, but the grade does not keep up, and the costs increase with depth, so that the outlook is not so good as it was last year. Other mines in this district are dormant, and the "Johannesburg of Utah" is very quiet.

On *Gold Mountain,* in Piute county, the Annie Laurie has continued to maintain a regular output, in spite of a shut-down during the summer on account of labor troubles; the lower tunnel is now near the vein, and this year should see the bonanza increase its output. The Sevier Consolidated has

added a mill this last summer and the development of the mine has been most gratifying, so that the district can point now to two producers and to a number of most promising prospects.

Frisco and Milford.—Near Frisco the Cactus mine is being rapidly pushed forward as an immense copper proposition, its ore-bodies are being developed by means of a long adit, water has been piped many miles for milling purposes, and plans for a town, an immense mill and a branch railroad are well under way; all these will doubtless mature during 1904, and thus another important source of copper will be added to Utah's list. The output of this mine will go to the smelters, now erected, for a period; but the well-informed expect that Mr. Newhouse will build a smelter for the Boston Consolidated and Cactus together, and thus take care of both outputs. The Majestic Company finished its smelting plant and has made a very successful initial run, closing down recently to continue development on its mines. The matte shipped has been of excellent grade, and thus promise of further copper product is given. The many prospects round Milford should help this smelting plant with an ore supply, and possibly enable it to maintain a steady production. At the old Horn Silver I hear that a plant to handle the tails by some new method is to be installed; this would help out this old producer, the ores of which carry too much zinc for the usual methods.

From the *Deep Creek* country I hear of good prospects, as also from several camps in the northern part of the State, but none are productive as yet.

Alta.—The famous old camp of Alta has been the scene of much development work during the year and promises to show up with several good producers during the coming summer.

The great plant of the American Smelting & Refining Company at Murray has run to full capacity and has smelted a total of over 40,000 tons of ore per month. There is a well authenticated rumor that this company intends to erect a copper smelting plant of large capacity in the near future, and at some point near at hand; if this is done, the Salt Lake Valley will be a smelting center unexcelled; even now the valley plants handle up to 100,000 tons of ore per month.

The strikes in the coal-fields and coke-ovens has interfered with the output of some of the smelting plants; they have all resorted to Connellsville coke at high prices, but this trouble promises to be of short duration, and at the present time it is the only cloud on the industrial horizon of Utah.

NEVADA.

By J. E. SPURR.

Since the discovery of Tonopah, in the summer of 1900, the desert State of Nevada has entered upon a period of renewed interest and activity in mining matters. The opening up and development of the rich silver and gold ores of the Comstock and Eureka, together with other famous camps, a few decades ago, was followed by the gutting of these mines, the decline in the price of silver, and the inevitable reaction which is the sequel to a period of reckless investment; Nevada declined, and its busy mining towns were deserted, sometimes almost to the last inhabitant, till to-day two representatives in the United States Senate stand for a population of about forty thousand.

Nevertheless, the State possesses in an eminent degree the first qualification for a successful mining industry; it has the ore. The geological conditions are exceptionally favorable. During the Tertiary period, this region was the scene of repeated and extensive volcanic eruptions, which were accompanied by the formation of mineral veins. Most of the rich deposits thus far discovered—such as the Comstock, Eureka, and Tonopah—were formed at this period. Moreover, the naked unvegetated reaches of the mountain ranges which separate the flat desert valleys, and the frequent deep cañons, offer to the prospector facility for finding whatever of valuable material may be contained therein.

On the other hand, there are certain adverse conditions which, until recently, have kept away the gold-seeker and the capitalist. These are the lack of water and fuel, and the consequent difficulty both in prospecting and in profitably mining ores when found. Added to this has been the damaged reputation of the region, as being a silver State, which could only expect to improve at that distant day when silver should be rehabilitated as a money metal.

Tonopah is a conclusive argument against these prejudices. Its discovery, like that of many another mining camp, was almost a matter of chance. The ore was a barren-looking quartz, and passed from hand to hand for some time, before it was finally assayed. But its richness, and the demonstration that it could stand high freighting and smelter charges and still pay a good profit, soon commended the camp to investors.

The outcropping veins at Tonopah, which cover a comparatively small area, became the property of the Tonopah Mining Company, and concentrated most of the attention of the public till this present year, so that Tonopah was wont to be wrongly called a one-mine camp. This company shipped to smelters ore to the value of a third of a million dollars in 1901, and of a million and three-quarters in 1902. In 1903 shipments have been actively made, but the general policy of the company has been to develop systematically and to plan for the future reduction of the already blocked-out ore reserves, both the shipping ore and the lower grade, at a better profit than at present. When it is understood that in Tonopah ore must run in the neighborhood of $100 to the ton or more, in order to be good shipping ore, the importance of these large bodies of so-called low-grade material is evident.

The year was an important one in Tonopah, on account of the development of ores beneath later volcanic cappings, outside of the area of the outcropping veins. The Montana Tonopah, not far from the Tonopah Mining Company's main shaft, encountered, at a depth of several hundred feet, strong veins, containing bonanzas rivalling those of the Mizpah ledge of the older company. The Montana Tonopah is understood to have shipped about $100,000 worth of ore this year, and a dividend of 5 per cent on the stock was declared in December—the first in the camp. According to report, the North Star has cut similar, or possibly the same, veins nearby. The Desert Queen shaft, on the Belmont property, also encountered rich bonanzas at an advanced depth. The Midway and the Tonopah & California, and, according to report, the Tonopah Extension, have encountered veins, carrying relatively good values, several hundred feet below the surface. Everything considered, therefore, the development of the camp is going on very satisfactorily. It is true that many of the explorations, other than those mentioned, have met with no success, and some of them have stopped from lack of funds. With as little as the Tonopah people have had to guide them, in the way of exploration, such an outcome must be inevitably the case. Increased attention to the geology of the district will partly remedy this.

Tonopah is fortunate in having apparently solved the water problem. Until a few months ago, the water for the town was a scanty supply from shallow wells several miles away; but experimental boring in a shallow flat has developed an abundant supply. Moreover, some of the shafts in camp have encountered a copious flow of water, necessitating one of them, the Halifax, to shut down pending the arrival of a pump. The water from this mine will be used for milling operations.

The question of transportation has been an important one, and several schemes have been on foot. A railroad was projected from Tonopah to Daggett, in the Mohave desert, there to connect with the Santa Fe Railroad, but the plan is one that requires considerable outlay.

A spur from Tonopah to some point on Senator Clark's proposed San Pedro, Los Angeles and Salt Lake Railway, connecting with the main road perhaps at Las Vegas, has been under consideration, and is perhaps not unlikely, although this could not be carried through for some time. The cheapest expedient evidently is to connect Tonopah with the Carson & Colorado Railroad, which is a branch of the Southern Pacific, and has its nearest point some 60 miles distant. Plans were made early in the year for such a connection, but they were not actively followed out, and now the Tonopah Mining Company has taken up the matter and is actively pushing it as its own undertaking.

Prospectors from Tonopah have located many new and old claims for several miles around, and while many of these camps are consumers rather than producers, some likely-looking deposits have been developed. Gold Mountain, about four miles south from Tonopah, has some good gold ores. Lone Mountain, 15 or 20 miles to the west, has a number of companies, often fraudulently classified as being in the Tonopah district. Some of these are stock-jobbing rather than mining operations; but others have produced ore. The Nevada Alpine, bought last year for a reported sum of $7,000, has in 11 months paid $70,000 in dividends to the owners. Many other camps, for the most part of growing importance, can be traced directly to the stimulus of the mother camp.

Outside of Tonopah, it is doubtful if there has been any very marked increase in the actual output of the State, though the mining business has held its own, and activity in prospecting and developing has greatly increased. Besides Nye county, in which Tonopah is situated, the two chief mining counties are Storey and Lincoln. In the former is the Comstock lode, steadily continuing its existence, though the rich ores which made it famous have been abstracted and only low-grade ores (meaning here $15 to $20 a ton) remain. During the past few years a combined attempt of the Comstock companies has been made toward creating better economic conditions, so as to make the working of the cheaper ores profitable. Electric power has been brought from the Truckee river, in California, 37 miles distant. In 1899 the work of unwatering the lower levels of the mines began with a hydraulic elevator. The work has been in progress since that time, but it is not yet completed. There are now eight producing mines on the lode, the Consolidated California and Virginia, Caledonia, Andes, New York Consolidated, Silver Hill, Yellow Jacket, and Justice. Over half the product of these mines comes from the Consolidated California and Virginia. For the year ending September 30, 1903, this company extracted 4,607 tons of ore, and the total yield of bullion for the ores sold or worked was $128,571. In the neighborhood of 500 men were employed in the Comstock mines, not far below the number employed at Tonopah.

Lincoln county possesses the De La Mar mines, another proof that, with energy and capital, desert mines may be made to pay. This district was not so fortunate in regard to its water as Tonopah has been, for none could be found near the town; so it has been pumped from the other side of a mountain range. De La Mar lies on the west side of the range, and the Meadow Valley wash on the east side. From a well in the wash the water is pumped, with a total lift of 1,500 ft., to the summit, and then flows by gravity to the camp. This year De La Mar followed the example of the Comstock in installing electric power. This work was completed in the early summer, the plant being 1,200 h. p., and able to furnish power to treat 700 tons of ore per day. The ore contains about equal values of gold and silver. This mine continues to hold its rank as the chief gold producer of the State.

In the extreme southern part of Lincoln county and of the State, near the Colorado river, the district of Searchlight has been active in producing, and a good deal of prospecting is going on near there. The Quartette mine has been working on its 600-ft. level. The ore is a gold ore and is treated

in a 30-stamp mill, with auxiliary cyanide plant. This mine, as well as the rest of the district, lay idle for several months this year as a consequence of the strike epidemic, which also threatened to invade Tonopah, but was happily averted. Nevertheless, a production of several hundred thousand dollars is credited to it for 1903.

Besides the principal camps, mentioned above, a considerable number of smaller mines in all parts of the State which have been steady producers for years in a small way, continue their operations, and many new enterprises, both in virgin ground and in long-abandoned camps, have been begun, some of which are paying profits.

The building of the San Pedro, Los Angeles and Salt Lake Railroad will give a great impetus to the mining districts in the eastern and southern part of the State, which will be furthered if some connection is made between this road and Tonopah. The question of fuel may be to a large extent solved by the use of electric power, and the finding of water, recently, in shafts at Tonopah and Searchlight holds out the hope that it may be secured when sought for, in many other localities.

SOUTH DAKOTA.

By SAMUEL S. ARENTZ.

The Black Hills mining industry has been active during the year. There were more companies formed in 1902 than in 1903, but the past season has seen an increased amount of development work in new territory. This is especially true of Elk creek, Rockford and Keystone.

The output of gold bullion in the Black Hills for the year ending November 1, 1903, reached a total of $7,159,400,* according to Mr. Thomas Gregory, the State mine inspector. Of this amount, approximately $25,000 was recovered from placers in Beach gulch and elsewhere.

Lead City is the principal mining center of the Black Hills. With the exception of the Deadwood-Standard, Spearfish, Clover Leaf and Holy Terror companies, all the large producing mines are within a radius of not more than 10 miles of Lead. The Homestake Mining Company, which produces the bulk of the Black Hills bullion, is situated here. The company treats over 3,000 tons of ore per day. It produced $4,500,000 in 1903. Its output will be increased by the addition of 100 stamps to the Amicus mill, which treats ore from a ledge of that name. The company's mine development is keeping up with the surface improvement.

Adjoining the Homestake to the west, the Hidden Fortune Company has carried out extensive exploratory work. It made several small shipments of rich ore to the Omaha smelter in the early part of the year, and is now in a position to furnish 250 tons of ore daily to the new cyanide mill below Deadwood. The Pennsylvania Company has been developing its property in Rutabaga gulch, and adjoining it the Gladiator Company has done some drifting, and has sunk a shaft in Deadwood gulch. This company is also developing the Gold Fish group, in the southern hills, on which it soon expects to erect a prospecting mill. The Belt Development Company, after sinking a shaft to a depth of nearly 1,000 ft. on the strike of the Homestake lode, shut down in early spring without finding ore. The Globe Mining Company's shaft, in White Tail gulch, above Lead, has reached a depth of 600 feet. The Oro Hondo Company, which has a large acreage, is sinking a shaft on the Homestake extension, below Kirk. The shaft is now 700 ft. deep.

At Maitland, in Black Tail gulch, the Columbus Company's shaft has reached a depth of 500 ft. Cross-cuts were driven from the 200 and 500-ft. levels into the Algonkian schists, and it is reported that large ore-bodies have been opened up. The company's 75-ton wet-crushing cyanide plant, at Gayville, treating Potsdam's silicious ores, ran steadily, except when the roads were impassable. The Columbus Company produced $90,000 in bullion during the year. The Penobscot, situated at Garden City, has had its new 125-ton cyanide plant in continuous operation, and produced $234,846 in bullion.

Previous to closing down in the early part of the year, the Imperial dry-crushing cyanide mill, situated in the first ward, Deadwood, treated 17,000 tons of ore from Black Tail and the Bald mountain district, and $90,000 in bullion was produced. The shut-down is reported to be due to the low tenor of the ore, combined with railroad charges of 75c. per ton for an eight-mile haul from its mines on Bald mountain.

The Rossiter cyanide plant, also at Deadwood, was operated, for the greater part of the year, by Dorr & Lundberg, who treated ore from their Buxton and Big Bonanza mines, in Fan Tail gulch, near Terry, and also custom ore. They ceased operations at Deadwood when work began on their 100-ton cyanide plant at the mines. During the year they produced $75,000 in bullion. The Dakota cyanide plant, after several months' shut-down for repairs, is again in operation on Bald mountain ore.

The Golden Reward cyanide plant has been in continuous operation, treating 200 tons of quartzite ore per 24 hours. The Golden Reward smelter, of 350 tons daily capacity, situated near its mill, in lower Deadwood, ceased operations in the middle of the year on account of labor troubles and the high price of coke. The combined bullion output for the year was $1,008,310.

At Galena and vicinity the Lexington Hill mill, in Spruce gulch, is being renovated, and the Golden Crest 10-stamp cyanide mill is in operation on Strawberry gulch. Wasp No. 2, in the Yellow creek district, has been working steadily on the quartzite, and produced $80,000 during 1903. The Alder creek cyanide mill, adjoining the Wasp No. 2, was active for a while, but has been closed for several months. Like its neighbor, most of the ore is mined by open-cuts. In this vicinity several new companies have done active work, and a fair amount of development has been done by individual owners.

The Clover Leaf Mining Company, between the Germania and Bare Butte districts, on Elk creek, is dropping 40 stamps on free-milling quartz. Its work during the past year has given an incentive to exploration in that locality. Work is being pushed below the 700-ft. level in the Uncle Sam mine, and drifts are being extended from the 600 and 700, which, it is reported, have made new discoveries. The output for the year amounted to $100,000. There has been much energy shown during the past season in the Bald mountain district, near Portland and Terry. All the ore treated from this district is known as the Potsdam silicious ore from the flat, blanket formation in the lower and middle Cambrian. The shafts seldom reach a depth greater than 250 or 300 ft., and much of the ore is mined from tunnels and open-cuts.

The Horseshoe Mining Company has been shipping from 400 to 600 tons of ore per month from the Ben Hur mine to the National Smelting Company's plant, at Rapid City. In the early part of the year this company also shipped considerable ore from the Lucile. Its new 600-ton cyanide plant was put into operation early in September, since which time it has been treating 300 tons daily. Most of this ore is mined in open-cuts on the Passaic, Sunnyside, Black Moon and McDonald, and more permanent developments are progressing on older properties.

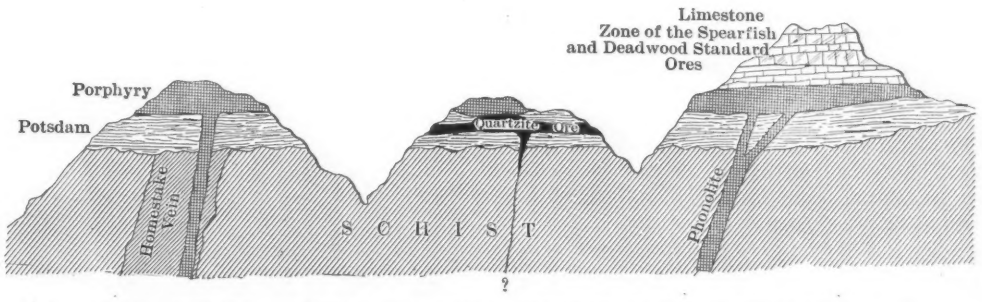
The Reliance Milling & Mining Company, formerly the Aksarben and University mining companies, located on Annie creek, has done some grading on a mill-site, and contemplates the erection of a 300-ton plant in the near future. This property has undergone considerable development during the past year by adits and drifts. Stripping is now going on preparatory to open-cut work.

At Ragged Top, the Spearfish mill, of 250 tons daily capacity, and the Deadwood-Standard, of 100 tons, have been working steadily on ores coming from the limestone. During the year the Spearfish Company treated a total of 63,484 tons of ore, with a bullion return of $269,661. The Deadwood-Standard produced gold to the amount of $87,500. Both companies are keeping development work well in advance of extraction, and the Spearfish Company is shaft-sinking. The Victoria Mining Company is also developing mines in this locality.

There has been increased development work in the southern hills in the vicinity of Rockford, Silver City, Keystone and Pactola. The Ohio-Deadwood, at Rockford, has opened up some free-milling low-grade ore. The Golden West 10-ton plant was operated for several months, and a Huntington mill was used on the Cochran property. Several other companies have done more or less work in this district, and some development has been accomplished at Mystic, as well as on the lead-antimony properties about Silver City. The Sunbeam mill, near Hill City, was operated for a time, and the Minnie May made several small shipments to Denver, and now has a prospecting mill in course of erection. A plant was erected at Pactola during the past summer to treat the creek sands by the cyanide process. Its success is questionable. Some work was done near Keystone in the extraction of mica and spodumene. The Grantz Mining Company sunk a shaft 280 ft. and did much surface work. The North Star treated small amounts of ore in its 10-stamp mill, and other properties in the vicinity underwent a small amount of exploration.

The Dakota & Calumet Copper Company has done considerable work on its property, near Sheridan, and during the past summer built a small smelter for the treatment of the carbonate ores.

The Nigger Hill district has seen renewed activity. The Tinton Company, in Bear gulch, which is exploiting tin deposits, has had men busy all the season. Besides the open-cuts on the outcrops of greisen, carrying cassiterite, a 'tunnel' has been driven 300 ft., and a 100-ton concentrating plant is in course of erection. The Golden Empire Company is sinking two shafts on auriferous bodies, as well as developing tin prospects. It is reported that a good deal of stream tin has been washed from Bear creek during the past season.



IDEAL SECTION, SHOWING GEOLOGICAL POSITION OF BLACK HILLS ORES.

*All figures on bullion output were taken from the State mine inspector's report.

Gneiss is a German word, derived from the Old High German *gneista*, a spark, this being a reference to the spangles of mica which characterize this rock.

IRON AND STEEL IN 1903.

By FREDERICK HOBART.

At the opening of 1903 the iron and steel trade in the United States was apparently at the height of its prosperity. The high rate of production, which had been going on through almost the whole year 1902, had been insufficient to meet current demands, and toward the close of the year imports of pig iron and steel billets formed an appreciable element in the market. Prices were generally high, and everything seemed to indicate a continuance of the prosperous term. Active demand, indeed, existed all through the first part of the year, and it was not until the second half was well advanced that people began to feel that the boom period was near its end. Signs of falling off in demand had not been wanting before that time, but they had been clear only to the older heads, who were accustomed to read and interpret the indications of the future of the trade.

Taking pig iron as a basis of the industry, we find that the approximate consumption of pig during the year was as follows, the figures of imports and exports for the month of December being estimated, and the production being based on the statistics given below:

	1902.	1903.	Changes.
Domestic production	17,821,307	17,942,840	I. 121,533
Imports	625,383	602,855	D. 22,528
Stocks at close of year	70,647	49,951	D. 20,696
Total supplies	18,517,337	18,595,646	I. 78,309
Stocks at close of year	49,951	605,000	I. 555,049
Exports	27,487	17,111	D. 10,376
Total deductions	77,438	622,111	I. 544,673
App. consumption	18,439,899	17,973,535	D. 466,364

The details of the production are shown in the tables which are given in the course of this article.

Iron Ore.—The production and consumption of iron ores in the United States in 1903 may be estimated as below, in long tons:

	1902.	1903.	Changes.
Lake Superior region	27,571,121	24,099,550	D. 3,471,571
Southern States	4,850,000	5,250,000	I. 400,000
Other States	2,215,000	2,256,000	I. 41,000
Total output	34,636,121	31,605,550	D. 3,031,571
Add decrease in stocks		703,169	I. 703,169
Add imports	1,165,470	1,089,000	D. 76,470
Total supply	35,801,591	33,397,719	D. 2,403,872
Deduct increase in stocks, Lake Erie ports	1,214,591		D. 1,214,591
Deduct exports	88,445	87,900	D. 545
Total deductions	1,303,036	87,900	D. 1,215,136
App. consumption	34,498,555	33,309,819	D. 1,188,736

While it is impossible to ascertain exactly the stocks in furnace yards at the close of the year, there is reason for believing that the total quantity of those stocks was less at the close of 1903 than at the end of the previous year. In many cases stocks were not laid in during the closing months of the year, when the necessity for closing down furnaces was generally admitted.

For the Lake Superior ores, we are able to give a very close statement, owing to the full records kept at the shipping and receiving ports. For the figures given below, we are indebted to the careful compilations from those records prepared and published by the *Marine Review* of Cleveland, Ohio. The figures given are all in long tons, and for the shipping, or navigation, year, ending December 1.

The shipments and deliveries of Lake ore for the year ending December 1 are summed up as follows:

Shipments:	1902.	1903.	Changes.
Lake Superior ports	21,625,465	19,371,989	D. 2,253,476
Escanaba	5,413,704	4,277,561	D. 1,136,143
Total lake	27,039,169	23,649,550	D. 3,389,619
Rail shipments	531,952	450,000	D. 81,952
Total	27,571,121	24,099,550	D. 3,471,571
Deliveries:			
Lake Erie ports	22,649,424	19,681,731	D. 2,967,693
Lake Michigan ports	4,389,745	3,967,819	D. 421,926
Direct to furnaces	531,952	450,000	D. 81,952
Total	27,571,121	24,099,550	D. 3,471,571

The total decrease this year, as compared with 1902, was 13.7 per cent. In the table above, the rail shipments for 1903 are partly estimated.

In addition to the totals given above, there were 203,419 tons shipped from the Michipicoton range in Canada, of which 170,672 tons were delivered at Lake Erie ports; leaving 32,747 tons sent to Canadian furnaces.

Though the total shipments for 1903 were less than in 1902, they exceeded those of 1901 by 3,510,213 tons, or 17.0 per cent.

The shipments of ore by water from the upper lake ports for the year were as follows, in long tons:

Ports.	1902.	1903.	Changes.
Escanaba	5,413,704	4,277,561	D. 1,136,143
Marquette	2,595,010	2,007,346	D. 587,664
Ashland	3,553,919	2,823,119	D. 730,800
Two Harbors	5,605,185	5,120,656	D. 484,529
Gladstone	92,375	85,816	D. 6,559
Superior	4,180,568	3,978,579	D. 201,989
Duluth	5,598,408	5,356,473	D. 241,935
Total, by lake	27,039,169	23,649,550	D. 3,389,619

The decrease from 1902 was 12.5 per cent. The totals for 1903, though less than those of 1902, exceeded the shipments of 1901 by 3,492,028 tons, or 17.3 per cent.

The full figures of production by ranges are not yet accessible; but the distribution of shipments by ports indicates that, approximately, the Vermilion and Mesabi ranges in Minnesota furnished 14,740,000 tons, or 61.2 per cent of the total shipments; while 9,360,000 tons, or 38.8 per cent of the total, came from the old ranges—the Marquette, Menominee and Gogebic—in Michigan and Wisconsin. In 1902, the proportions were 56 and 44 per cent, respectively.

The receipts at Lake Erie ports in detail are reported as follows:

Ports.	1902.	1903.	Changes.
Toledo	1,037,571	652,305	D. 385,266
Sandusky	165,556	130,532	D. 35,024
Huron	520,646	486,106	D. 34,540
Lorain	1,442,417	990,490	D. 451,927
Cleveland	4,873,318	4,434,160	D. 439,158
Fairport	1,538,744	1,434,342	D. 104,402
Ashtabula	4,796,805	4,242,160	D. 554,645
Conneaut	4,300,301	3,903,937	D. 396,364
Erie	1,717,268	1,257,798	D. 459,470
Buffalo	2,256,798	2,149,901	D. 106,897
Total	22,649,424	19,681,731	D. 2,967,693

Tonawanda is included with Buffalo in these statements. Every port showed some falling off, the larger proportional decreases being at Ashtabula, Erie, Lorain and Toledo.

The stocks on docks at Lake Erie ports on December 1 were as follows, in detail:

Ports.	1902.	1903.	Changes.
Toledo	310,023	106,710	D. 203,313
Sandusky	95,175	95,275	I. 100
Huron	232,764	253,249	I. 20,485
Lorain	328,304	288,581	D. 39,723
Cleveland	1,500,604	1,337,750	D. 162,854
Fairport	924,236	845,946	D. 78,290
Ashtabula	1,967,136	1,911,911	D. 55,225
Conneaut	673,679	591,364	D. 82,315
Erie	722,966	657,409	D. 65,557
Buffalo	319,367	282,890	D. 36,477
Total	7,074,254	6,371,085	D. 703,169

Only two ports showed an increase in stocks. The total stocks this year were larger than those reported in 1901 by 511,422 tons.

Shipments of ore to furnaces taking their supplies from Lake Erie ports compare as follows for the navigation season, from May 1 to December 1:

	1902.	1903.	Changes.
Dock stocks, May 1	2,848,194	3,592,367	I. 744,173
Receipts for season	22,649,424	19,681,731	D. 2,967,693
Total supply	25,497,618	23,274,098	D. 2,223,520
Dock stocks, Dec. 1	7,074,254	6,371,085	D. 703,169
Shipments to furnaces	18,423,364	16,903,013	D. 1,520,351

The decrease in dock stocks this year was due to the lighter receipts in September, October and November of this year.

The actual consumption of Lake ore—or at least the delivery to furnaces—may be estimated as follows, for the full year:

	1902.	1903.	Changes.
Shipments, as above	27,571,121	24,099,550	D. 3,471,571
Decrease in stocks		703,169	
Total	27,571,121	24,802,719	D. 2,768,402
Less increase in stocks	1,214,591		
Deliveries	26,356,530	24,802,719	D. 1,553,811

The ore going to Lake Michigan ports—chiefly Milwaukee and South Chicago—is delivered directly to furnaces and is not stored on docks, as at the Lake Erie ports.

Pig Iron.—The production of pig iron in the United States in 1903 showed a small increase over the high point reached in 1902. In the following statement the figures for the first half of the year are those of the American Iron & Steel Association; those for the second half are estimated on the basis of the weekly capacity of the furnaces in blast, as reported by the *Iron Age* each month. The statement is as follows:

	1902.	1903.	Changes.
First half	8,808,574	9,707,367	I. 898,793
Second half	9,012,733	8,235,473	D. 767,260
Total, year	17,821,307	17,942,840	I. 121,533

The increase in the first half of the year was so great that the rapid decline of output in the last quarter did not overcome the gain.

Assuming that the division of pig iron, as classified by the Association, was substantially the same in the second half as in the first half of the year, we have the following statement:

	1902. Tons.	1902. Per ct.	1903. Tons.	1903. Per ct.
Foundry and forge	5,176,568	29.1	5,382,912	30.0
Bessemer and low phosphorus	10,393,168	58.3	10,133,661	56.5
Basic pig	2,038,590	11.4	2,225,002	12.4
Spiegeleisen and ferromanganese	212,981	1.2	201,265	1.1
Totals	17,821,307	100.0	17,942,840	100.0

The changes shown, in quantities and percentages, by this statement were as follows:

	Changes. Tons.	Changes. Per ct.
Foundry and forge	I. 206,344	I. 0.9
Bessemer and low phosphorus	D. 259,507	D. 1.8
Basic pig	I. 186,412	I. 1.0
Spiegeleisen and ferromanganese	D. 11,716	D. 0.1
Total	I. 121,533	...

The total increase over 1902 was only 0.7 per cent. The conditions affecting the output last year are more fully stated elsewhere.

Steel.—The production of steel in the United States, in 1903, did not vary greatly from that of 1902, as is clearly shown by the figures of pig iron production. The only change probable was a slight increase in the make of open-hearth steel, especially of the basic variety, as compared with that of bessemer. We estimate the output of steel for 1903, therefore, at 14,960,000 long tons, of which 9,140,000 tons were bessemer, 5,700,000 tons open-hearth, and 110,000 tons crucible and special steel. This distribution, however, may be changed by the completed returns without affecting the correctness of the total given. Substantially all of the bessemer steel was acid steel. Of the open-hearth steel about 4,600,000 tons were basic and 1,100,000 tons acid steel. The production of finished material remained about the same. There was probably an increase in structural material and plates, with some falling off in sheets and in wire products.

Metallurgical Progress.—So much of the energy embodied in the trade during the year was devoted to the increase in output that no important metallurgical changes can be reported. Several important new plants, including blast furnaces and steel works, were completed, and put into operation, and there was a general extension of production based upon the extraordinary demand of the previous two years. An important establishment recently put in operation was the Clairton plant, owned by the Clairton Steel Company and controlled by the Crucible Steel Company of America. The great works of the Lackawanna Steel Company, at Buffalo, were not quite completed, but a portion of them have been put in operation. An important feature in this plant is the utilization of the waste gases from the blast furnaces for the production of power. It is expected that some 30,000 h. p. will be obtained, part of which will be used to furnish blast and the balance to generate electricity, to be transmitted to different parts of the works where power is needed.

Abroad there are not many important metallurgical changes to be noted. The use of blast furnace gas is extending in Belgium, France and Germany, and is being introduced, to a certain extent, in British furnaces. Experiments continue to be made in England with the Talbot continuous steel process, and some improvements are said to have been made. The Edison magnetic concentrating plant for concentrating and separating the impurities from Norwegian ores, in which a large amount of British capital was invested, is not yet in commercial operation. Further experiments have been made in smelting ores by electricity; no especial progress can be reported in this direction.

United States Exports and Imports.—Export business during the past year was naturally affected by the large demand and the high prices in the domestic market. Toward the end of the year, when trade began to fall off, a movement was begun to export material to foreign markets, but this has been so recent that no results can be reported as yet, and any expansion of our export trade will be shown in the returns of 1904. The exports of iron and steel, including machinery from the United States for the 11 months ending November 30, were valued at $89,685,201, against $90,136,024 in the corresponding period of 1902, and $94,112,782 in 1901. Most of this business was on the lines in which we have had an established trade, the exports of pig iron, steel billets and wire bars, and of rails, which made an important figure three years ago, having fallen almost to nothing. The following table shows the leading items of these exports for the 11 months:

	1902.	1903.
Pig iron	26,277	15,311
Scrap	9,040	5,289
Bar iron	19,192	19,019
Wire rods	21,198	21,344
Steel bars	8,693	15,080
Billets, ingot and blooms	2,409	1,380
Steel rails	66,854	23,130
Iron sheets and plates	3,235	4,632
Steel sheets and plates	13,984	11,738
Structural material	51,776	27,707
Wire	91,579	29,560
Cut nails	6,701	8,195
Wire nails	24,144	29,514
Other nails, including tacks	1,899	2,062

Imports, on the other hand, showed a substantial increase chiefly in the lines of raw material, such as pig iron, scrap, steel ingots and bars. This gain, however, while proportionally large, was small in comparison with our total production. The total imports for the 11 months were valued at $39,513,847, against $36,766,961 for the corresponding period in 1902, and $18,276,862 in 1901. The following table shows the principal items of these imports for the 11 months, stated in long tons:

	1902.	1903.
Pig iron	507,010	584,855
Scrap	97,361	80,396
Bar iron	25,509	39,284
Iron and steel rails	57,495	93,488
Steel ingots, slabs, billets or bars	263,088	260,133
Sheets and plates	6,133	11,211
Tin and terne plates	51,264	44,859
Wire rods	18,607	19,012
Wire and wire articles	3,173	4,539

It is to be noted that these imports were almost wholly in the last half of 1902 and the first half of 1903. In the later months of 1903 they fell to comparatively low figures. Thus if we take as typical the imports of pig iron and of steel ingots, billets and bars, we find that in January, 1902, they were 7,833 and 5,312 tons, respectively; while in November of that year they were 100,400 and 41,077 tons, respectively. In January, 1903, we imported 110,679 tons of pig iron and 38,691 tons of crude steel, while in November the imports were only 18,765 tons of pig iron and 6,580 tons of steel.

Foreign Countries.—In most European countries the course of the iron trade in 1903 nearly reversed our own. The year 1902 was one of comparative depression in Europe, while 1903 was one of recovery and improvement in business. In Great Britain the estimated production of pig iron for the year is 8,000,000 tons, and there are more furnaces active at the close of the year than at its opening. The export trade showed a considerable improvement, and demand for both raw and finished material is better as the new year opens than it has been for several years. The only drawback to the advance has been a serious falling off in the shipbuilding trade.

In Germany the iron trade has also shown a great improvement, a marked evidence of which is the gain in the production of pig iron. For the 11 months ending November 30, the output is reported by the German Iron & Steel Union as below in metric tons:

	1902.	1903.	Changes.
Foundry iron	1,465,880	1,648,987	I. 183,107
Foreign iron	1,094,515	785,361	I. 343,710
Spiegel and steel pig		652,864	
Bessemer pig	353,255	402,445	I. 49,190
Thomas (basic) pig	4,735,075	5,747,229	I. 1,012,214
Totals	7,648,665	9,236,886	I. 1,588,221

The total increase shown this year is 1,588,221 tons. On this basis the total production of Germany, for the full year, will be nearly 11,000,000 tons, largely exceeding that of Great Britain. Export trade has been very good in Germany during the year, as well as business at home, and the prospects for 1904 are excellent.

In other European countries, Austria-Hungary, France, Sweden, and Spain, there have been very few changes during the year, and the output for 1903 shows little variation from that of the preceding year.

The Iron and Steel Markets.—The course of the iron and steel markets in 1903 is well shown by the reports of our correspondents which follow, and which give a comprehensive view of local conditions. This is especially the case with the Pittsburg report, which covers operations in the largest and most important primary market in this country.

The unprecedented demand and the high prices with which the year opened, and which lasted well through the first half, began to show a falling off soon after the middle of the year. Labor troubles, especially in the building trades, gave the first warning, and this was followed by other symptoms which soon showed to experienced observers that the boom period was approaching its end. The diminution in the number of contracts offered, coupled with demands for concessions in prices, followed rapidly, and the year closes with many plants shut down, and with others working with reduced energy. It is quite possible that the restricted movement has gone somewhat too far, and that there will be an improvement with the opening of the new year, but the prospect is for less activity in 1904.

Much seems to depend upon prices. The agreements, under which quotations of various leading articles have been controlled, still continue in force. Near the close of the year the Steel Billet pool made a considerable reduction in its price. Concessions were also made in bars, and some other lines of material, as shown in detail below. The plate, structural and rail pools, however, decided to maintain prices, the immediate result being an almost total cessation of orders. It is evident that buyers still hope that such action will force reductions and put the trade upon a better footing. The result remains to be seen.

Another feature which marks the close of the year is the reductions in wages proposed by many large companies. In some cases these reductions have been accepted by the workers, but in others it is evident that a stand will be made to maintain present rates of wages. The trade is, therefore, threatened with a succession of labor struggles during the first part of the coming year. Our ability to export depends largely on the establishment of lower wage scales.

Not only has demand diminished for the present, but the effect of the extension of manufacturing and the construction of new plants furnishing a larger supply of material is now being felt. The increase in the capacity of production of both raw and finished material is very considerable, as will doubtless be shown during the coming year.

PITTSBURG IRON AND STEEL MARKET IN 1903.

By Our Special Correspondent.

The iron and steel trade, in the year just ended, was the reverse of the preceding two years, and like that of 1900, in that there was a gradual decline instead of advance in prices of several important lines from the opening to the close. There was not so heavy a drop, however, last year. The greatest reductions were in pig iron, and in steel billets and steel bars. Bessemer pig iron sold in January at $22.35, while in December $14.50 was quoted, and the demand was extremely light. Sales of bessemer billets at the opening of the year were at prices around $30 and $31; and before the year ended $23 was the uniform price for both bessemer and open-hearth billets. In 1900 bessemer pig sold in January at $25 and in December at about $14, while bessemer billets dropped from $35 to $20. The year cannot be regarded as a satisfactory one, there being a number of discouraging features. Furnaces had great difficulty in the opening months in securing coke, on account of the railroad blockade, which continued from the previous fall. Many furnaces were banked for days at a time, and to get coke unusual prices, ranging from $5 to $8 at the oven, were paid. This condition of affairs continued until early spring, when the blockade was removed.

Then came troubles in the building trades which not only checked buying of structural material, but delayed specifications on contracts. All the mills were crowded with orders for structural material early in the year, and the outlook for a heavy business throughout the year was very bright. In March a strike was ordered against the American Bridge Company by the International Association of Bridge & Structural Iron Workers, and a number of important contracts were tied up in this district for six weeks. The erection of a large number of buildings, that had been contemplated, was deferred on account of the uncertainty due to the extravagant demands for advances in wages by labor organizations of the various trades.

There was no change in the prices of steel rails, plates and shapes. The rates of $28 for rails and 1.60c. for shapes and plates which were established in April, 1901, continued throughout the year. There was no great fluctuation in other leading lines outside of a heavy drop in merchant steel bars. The price of 1.60c. for steel bars, which became effective in April, 1902, continued until November last, when it was cut to 1.30c., or $6 a ton. The price of nails remained around $2 a keg all year. Wire nails sold in January and December at $1.90, but during ten intervening months the price was $2. Cut nails sold in the first quarter at $2.10, and were advanced to $2.15, dropping to $1.90 in November. Sheets were weak throughout the year. Black sheets, No. 28 gauge, were quoted at 2.75c. for the first half, but it is known that concessions were made on desirable orders. The American Sheet Steel Company was getting most of the business, as independents had difficulty in meeting the low prices, owing to the high price of sheet bars and the advantage the big interest possessed in the matter of unlimited production at its non-union plants. In November the big sheet company announced a reduction in prices, making the rate of No. 28 gauge black sheets 2.40c., and 3.40c. for galvanized. Some concessions, it is reported, were made on these low rates. There were no material reductions, or changes in the price of ferro-manganese. It was quoted at about $50 until late in the year, when it dropped to $48, and sold in December at $47. On January 2 an advance of $1 a ton in the price of plain wire was announced, and a further advance of $2 was ordered on February 23, which made the price 1.90c. base. These advances, however, did not indicate a stronger market, but were due to the removal of competition through the absorption by the United States Steel Corporation of the Union-Sharon wire plants. The deal was concluded late in November, 1902, and during that year the price of wire products had been cut $7 a ton.

There was a good demand for tin-plate during the first half of the year, and on March 10 the American Tin-Plate Company advanced the price from $3.60 to $3.80 a box. The company had captured a large amount of rebate trade, for which business the workers had made a concession in wages, paying 3 per cent of their earnings into a fund from which the company was paid 25 per cent of the labor cost on all plate going into the rebate or export trade. The collection of 3 per cent of the workers' wages for this fund was stopped on June 1, as there was enough domestic trade to keep the mills busy. The independents, during the busy canning season, obtained premiums of 10 and 15c. a box above the fixed price. Trade became dull at the close of the canning season, and on October 1 the collection of 3 per cent of the workers' wages for the rebate fund was resumed, and the American Tin-Plate Company

again went after foreign business. In November the price was reduced to $3.60 a box, and a large number of the independent producers were forced out of the market. The outlook for pig iron at the opening of the year was remarkably good, there being every indication that firm prices would prevail, and that production would exceed all former years. This belief was not dispelled until after the first quarter, the lack of new business being attributed to hesitation of buyers, owing to the inability of furnaces to operate steadily, because of the freight congestion and the shortage of coke. The United States Steel Corporation did not come into the market for a large tonnage, as had been expected. It had an option on 150,000 tons of bessemer iron for delivery during the second half at $20.50, Valley furnaces, or $21.35, Pittsburg. As the average price for January was just $1 higher to the general trade, it was believed pig iron would be held at a profitable figure throughout the year. On March 25, however, the Corporation allowed its option to lapse, and on April 1 southern producers announced a reduction. Just before these announcements were made, independent steel interests contracted for bessemer pig iron aggregating 75,000 tons at prices ranging from $20.85 to $21.50, Pittsburg. There was plenty of coke in April, and the furnaces were operated to their full capacity; Clairton furnace No. 1 was blown in April 21. In May, sales of bessemer iron to independents aggregated 60,000 tons, at prices ranging from $20.75 to $21, Pittsburg. On May 26 the United States Steel Corporation came into the market, buying 100,000 tons at $19, Valley, for June delivery, and $18.50 for delivery in the third quarter. The Bessemer Furnace Association got 43,000 tons of this order; W. P. Snyder & Co., 40,000 tons, and Rogers, Brown & Co., 17,000 tons. This contract had the effect of stimulating the market, but there was no heavy buying, and prices continued to drop. Small orders only were placed, and all were for immediate shipment. Clairton furnace No. 2 was blown in on June 23. The production of pig iron this month was heavy, all the Valley furnaces being in operation, but the product was not sold, a great deal going into stock. Prices, however, were fairly well maintained, until about the middle of the third quarter, when there was considerable shading, but the extent was never made public. The average price quoted for August, at which a number of important sales were made, was $17.85, but it is certain that a large tonnage was sold at a less figure. On September 29 a meeting of the furnace interests of the Central West was held here, and a movement was started to restrict production in order to maintain prices. It was decided to curtail production from October 1 to January 1 by 25 per cent, and all but about 17 per cent of the producing interests entered into the agreement. Before December 1 the lack of business had the effect of curtailing production more than 50 per cent, and prices declined almost to the low point reached in the last quarter of 1900.

An important deal was supposed to have been closed in July. The announcement was made that the United States Steel Corporation had taken over a half interest in the Clairton Steel Company, a subsidiary concern of the Crucible Steel Company of America. The amount of the purchase said to have been agreed upon was $6,000,000. Early in October W. P. Snyder, president of the Clairton Company, went to New York to obtain a settlement. Instead of receiving the cash expected he was told that "obstacles have arisen which prevent the plans being carried out." This announcement had a depressing effect on the stock market and on conditions in general. The failure to complete the deal necessitated a reorganization of the Crucible Steel Company of America. More than $2,000,000 was raised to provide working capital for the Clairton plant, and William G. Park was made chairman and given full control. The United States Steel Corporation began to retrench at that time, and operating expenses have been greatly curtailed within the past two months. Early in the year the American Steel Hoop Company and the National Steel Company were absorbed by the Carnegie Steel Company and put under the direct control of President W. E. Corey. In August Charles M. Schwab resigned the presidency of the United States Steel Corporation and Mr. Corey took his place, A. C. Dinkey succeeding him as president of the Carnegie Steel Company. The consolidation proved so successful that others were considered, and in November plans were made for combining the American Tin-Plate Company and the American Sheet Steel Company, to become effective on the first of the year. Wages were reduced late in the year at a number of the non-union works, and a general plan for cutting down expenses on the first of the year was outlined.

The H. C. Frick Coke Company, a part of the big corporation, was not in the coke market until late in October, as the entire product was used at the plants of the corporation. Furnace coke sold during the first half at $3 a ton, and foundry coke was $1 and $1.50 higher. Prices began to drop in the last half, and in December furnace coke sold as low as $1.50 and foundry at from $2.25 to $2.50. The independent coke operators got together on October 24, and formed a pool which was composed of 23 interests. The object was to maintain prices, but the plan failed. A general meeting of coke interests was held later to discuss some plan for protecting the industry. The matter was put in the hands of a committee.

There was a heavy demand for common iron bars at the opening of the year and prices were advanced to 1.80c. The puddlers and finishers in the mills of the country, that are operated under the wage scale of the Amalgamated Association of Iron, Steel & Tin Workers, were greatly benefited, as their pay is based on the selling price of bar iron. The puddling rate in January and until July 1 was $6.12½ a ton, when it was advanced to $6.25 a ton, being the highest rate paid in 20 years. Prices began to decline, and the puddling rate went down to $6 on September 1 and to $5.75 on November 1. During the last two months of the year, bar iron sold as low as 1.30c. and when the next bi-monthly adjustment of wages is made on January 10, it is likely the puddling rate for the first two months of the year will be fixed at $5 or $5.25 a ton. The capacity of the sheet mills of the country is in excess of the consumption and as a result the independent manufacturers who operate under the Amalgamated Association scale, which limits production, were unable to get much business, as they could not compete with the non-union plants where there was no limit. The Amalgamated Association was asked to assist by removing the limit. On August 31 a special convention of representatives of the sheet mill lodges was held in this city. After discussing the matter for two days it was decided to make no change. Prices of sheets continued to decline, and No. 28 gauge black sheets were quoted as low as 2.40c. Another request was made by the independent sheet manufacturers and a second special convention was held on December 8. It continued in session a week. This convention practically removed the limit by increasing it from 135 to 150 pairs a turn. The base of the sheet scale, which has been 3c. for Nos. 26, 27 and 28 gauges was reduced to 2.50c., which means a cut of 10 per cent in wages. Under the Amalgamated scale the pay advances 2 per cent with every 0.01c. increase above the base and declines 2 per cent with every drop of 0.01c. in price to the base of the scale.

PRICES OF IRON AND STEEL IN PITTSBURG.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Bess. pig	$22.35	$21.85	$21.85	$21.35	$20.00	$19.85	$19.00	$17.85	$17.00	$16.00	$15.10	$14.50
Foundry No. 2	23.00	22.00	21.50	21.50	21.00	20.50	18.75	17.50	16.00	15.25	14.50	14.25
Gray forge	21.00	21.00	20.75	20.25	19.75	19.25	17.50	16.00	15.25	14.25	13.25	13.00
Bess. steel billets	30.50	30.00	30.50	31.00	31.00	30.00	27.00	27.00	27.00	27.00	23.00	23.00
Sheets No. 28	2.75	2.75	2.75	2.75	2.75	2.75	2.70	2.70	2.70	2.70	2.40	2.40
Tank plate	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
Steel bars	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.30	1.30
Steel rails	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Wire nails	1.90	1.90	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.90	1.90
Cut nails	2.10	2.10	2.10	2.15	2.15	2.15	2.15	2.15	2.15	2.15	1.90	1.90
Ferro-mang. dom.	51.00	50.00	50.00	50.00	50.00	50.00	50.00	49.00	48.00	48.00	48.00	47.00

ALABAMA IRON.

By Our Special Correspondent.

A retrospective glance at Alabama's coal, iron, steel and kindred industries in the year just closed does not bring forth a picture gloomy in the least. As a general proposition, with reference to the aggregate business done, the situation sums up well and shows that Alabama made much progress during the year. Though trade was not as lucrative at the close as at the commencement of the year, there was little suffering, and, as far as can be learned, but little actual loss.

The year 1903 closed with conditions precisely the opposite to those prevailing when the year started. In January prices were high for pig iron and other metals. The demand was not at its best, though good. A couple of months later showed the market still strong as to quotations, but consumers were inclined to hold off in their buying until some concessions should be made. Furnace men were able to hold up prices for week after week, but before the middle of summer surplus iron began to accumulate in the yards. The close of the year found the market turning from a dull spell, with a very active demand, and prices only a little advanced over the lowest quotations in the history of iron-making in Alabama, except for the period 1894 to 1897. January saw No. 2 foundry quoted around $17.50, $18.50 and $19 per ton. The close of the year found No. 2 foundry firm at $9.50, but tons and tons of the product had been sold at $9, and even lower.

There was a good increase in production over the preceding year. For eight months the furnaces worked steadily, and turned out a large output. A slight curtailment commenced when the demand fell off, and the manufacturers thereupon asked the railroads to concede 50c. per ton in freight rates, so that iron could be sold and shipped in a declining market. It was not until October, however, that resolutions were adopted, and, to a certain extent, carried out, to reduce the production of pig iron in the Southern territory, which resulted in curtailing the output about 33 1-3 per cent. The production of Alabama for 1902 is given at 1,472,211 tons. It is estimated that the output in the past year was about 1,500,000 tons, although this is taking a liberal view. For the first half of 1903 the records show a production of 777,870 tons; it is believed that the production during the last half of the year was about 725,000 tons.

There was no great accumulation of iron in Alabama until June, and before the middle of July the reports showed more than 100,000 tons of iron stacked in the yards of the larger manufacturing companies. A month later prices had descended rapidly, and those furnaces which purchased their raw material found it no easy matter to keep in operation at the prevailing quotations, and readily assented to a proposition to consider curtailment, in the hope of strengthening the market. But the larger furnaces did not reduce their production in proportion, as they were in position to make iron cheaply, and at the close of the year they were turning out almost as much iron as at the start.

During 1903 work was started on three or four new blast-furnaces. Several furnaces were repaired, practically rebuilt, and equipped with new and modern machinery. Two large, new furnaces went into operation during the year—one at Gadsden, belonging to the Alabama Consolidated Coal & Iron Company, and the other at Holton, in Tuscaloosa county, belonging to the Central Coal & Iron Company. The Tennessee Coal, Iron & Railroad Company started work on a

new furnace at Ensley, the Alabama Steel & Wire Company on one at Gadsden, the Woodward Iron Company one at Woodward, and the Lookout Mountain Iron Company one at Battelle, in DeKalb county. As stated, several furnaces were thoroughly repaired during the past year, notably one of the Sloss-Sheffield Steel & Iron Company's furnaces in the Sheffield district; one of the Republic Iron & Steel Company's Thomas furnaces; the Tennessee Coal, Iron & Railroad Company's furnace at Bessemer, and one at Ensley, and the Woodward Iron Company's at Woodward.

At the end of the year there was less than 60,000 tons of iron in the yards around Birmingham, with the half of that either sold or in prospect of being sold. The furnaces are in fairly good shape, very few of them needing much actual repairing. The companies have refrained from selling too much iron at the low prices, so that less than three months of 1904 will end the deliveries for the bulk of business taken on the low basis.

A retrospect of the year's trade in finished iron and steel does not show up as well as that of pig iron. The rolling mills had their ups and downs. With the exception of the month of July, the different rolling mills in this State were operated pretty steadily until the first of October. The demand for the finished product began to decline early in the summer, but the mills kept up their steady operation, and did not stack up any of their product at any time. There was no showing made at all in the mills during the month of July, and there was no effort made to start up the mills again until August. But the situation became more and more strained, and the larger mills shut down in October. Up to July the conditions with the rolling mills were most favorable; in fact, they were better than during the first half of the previous year; but in the last half the reverse was true.

The steel plant at Ensley belonging to the Tennessee Coal, Iron & Railway Company was operated steadily for nine months in the year, and fairly well during the tenth month. In November there was a shut down, and the last two months the output amounted practically to nothing. At the steel rod, wire and nail mills no work was done at all this year. The steel plow works at Ensley changed hands during the year, and were improved and put in operation on a better scale than ever before.

THE CLEVELAND IRON MARKET IN 1903.

By Our Special Correspondent.

The iron and steel situation in this territory during the past year has been a natural evolution from conditions which existed when the year was opened. It has also been a study into the Steel Corporation and its influences. The year opened with high-priced pig iron being used by all foundries and mills, and with contracts running through the first half of those prices. Mills like those of the Steel Corporation, which could make their own pig iron and save the profit on it, were able to hold to conservative prices for the finished product, but the smaller mills, being forced to pay high prices for pig iron or billets, were compelled to ask higher prices for their finished product. This resulted in a list of premium prices for finished products, which, before the year was over, destroyed the equilibrium of the market, sending the prices first rapidly up the scale and then down toward the close. The reduction was even more radical than the advance.

Pig Iron.—In the pig iron trade the evidences of a possible decline in the trade began very early. The latter part of the year 1902 was given over to violent efforts on the part of the pig iron producers to catch up with their orders. The forced delay to the furnaces, due to the shortage of coke and the distress into which the car shortage threw the shippers, had made all of the producers fall far behind their contracts on pig iron tonnage. The result was that the first three months of the year was given over to a contest between the new orders and the old for delivery. There was some talk, the first two months of the year, of further importations from Canada or England, but it very soon became apparent to the trade that the market would need no such relief, but that the future difficulty would be in getting the consumers to come into the market to such an extent as would keep the furnaces busy. This situation obtained principally in the trade on foundry. Bessemer and basic producers had about all they could do for the first six months of the year, keeping abreast of the demand from those who had contracts. In the basic trade it was not until after the first of August that the furnace owners were able to say that they had fully filled their old contracts, which had been hanging over them from six to nine months.

In June apprehension began to appear lest the market would not afford that amount of business for the second half which it was hoped would be the case. The result was that very little new business was done until after July 1, and then consumers showed a tendency to buy from hand to mouth. Those who have cared to analyze the situation are aware now that the price of semi-finished material had more to do with the checking of business than did the rather excessive cost of the price of the finished product, the pig iron market seeming to be the root of the evil. Toward the close of the third quarter the furnaces began to find the necessity for a reduction of the price of pig iron, and soon after that the furnaces in this territory took formal action, reducing the output 25 per cent during the last quarter. This was brought about by the lessened trade and by the large increase of productive capacity, 25 new 400-ton furnaces having been blown in during the summer. The southern stacks came to play a big part also, shipping iron in here very freely, and carried on the war until prices dropped in the Birmingham district to $9 a ton. This brought about a corresponding revulsion against high prices in the north, with consequent reductions. No. 2 foundry iron in the north dropped from $24 to $14 in the Valleys. Bessemer and basic fell rapidly, but the lack of sales prevented the making of prices at the close. The market for the year closed with an apparent necessity of further reduced prices and output, but with some indication of a revival of business, which was, in the main, very favorable.

Finished Material.—The close of the year finds the principal interest in the steel trade centered in steel bars. It is also evident, upon even a casual survey of the situation, that this grade has dominated the market all year. There was a contention from the first of the year. In most instances the buyers for delivery between July 1, 1902, and July 1, 1903, had been able to make terms with the mills when bar steel was at 1.50c., Pittsburg, for the bessemer quality. Immediately following the placing of those contracts the year before, steel bars had gone up $2 a ton. When it came, during the early part of last spring, to making contracts with the bar consumers, the steel men found that the advance was not liked, and that consumers were inclined to hold for the prices obtained the year before. The failure to agree brought out the first hesitation in the steel market. Developments toward July, when the New York market was in a tumble, led the consumers to hesitate until the crops should develop during August, and then later to wait for business conditions to turn. These elements of uncertainty, added to the obstinacy on the part of the steel mills as to prices, caused a serious delay. About October 1, the mills began accepting bar contracts guaranteeing the price against a decline, and this precedent was followed for a month and a half, when a violent reduction of steel bars was made, carrying the basis down to 1.30c., Pittsburg, for Bessemer steel. This reduction had been brought about by the steady fall in bar iron and the fact that bar iron was being substituted for steel. Bar iron had fallen from 1.80c. to 1.30c., Youngstown, and the year closed with even that price being shaded.

The structural steel trade was influenced more than any other by the labor situation. It became evident early in the year that the contractors who were at work on buildings were having extreme difficulty to get along with the men, and make any profit out of the construction. This was aggravated in this territory by fabulous stories coming from New York, where labor difficulties developed early out of reports of extortions on the part of the unions. The trade came to a halt in the middle of July, and it can hardly be said that any appreciable amount of businesses was done during the remainder of the year. The buying after that period was hand to mouth, or shipments were made upon consumers' specification being urged against the old contracts. The year opened with the smaller mills demanding 2 to 2.25c. for structural at the mills for spot delivery, and getting it. The cancellation of orders with the larger mills, and the refusal or failure to specify against old contracts, soon placed the larger mills in position to make very prompt shipments, which soon cut the smaller mills out of their premiums. By May all mills were in the market for business and no high prices were asked. By July specifications against old contracts were lagging seriously, and some of the smaller mills, which had sold at high figures, waived the premium, if the consumer would specify. The market closed with a very dull trade, with small orders, and demand being made for a reduction of prices. One of the peculiar features of the market has been the similarity throughout the year in the plate and the structural trades. The plate trade began its decline about the time the first symptoms of weakness came in the structural trade. It sagged throughout the year, although influenced by the lack of a railroad demand instead of by labor difficulties.

The sheet trade has been dull throughout the year. It was supposed that the usual spring revival would come, and for a few weeks following March 15 it began to appear as if the expected revival were about to materialize. The large addition to the productive capacity of the country, however, soon began to make itself felt, and the trade, being divided among so many producers, soon showed signs of weakness. There was a contention through the summer and fall between the association and the smaller mills, ending in a cut in prices, first of billets and sheet-bars and then of the finished sheets in November, which carried the prices down to the lowest level in years, the phenomenal reduction of $8 a ton having been made.

The billet war was a fight in itself which was interesting. The Steel Corporation having planned to run some of the new competition in sheets out of the market, kept the prices of sheet-bars and billets up to the point where the independents could not convert them. This brought out a cut on the part of the independent billet makers, which resulted in a retaliatory cut by the association and a second cut by the independents. Early in November the association mills dropped to $23.50 Cleveland for bessemer 4 by 4 billets, whereas the same material earlier in the year had brought $32, Pittsburg.

At the beginning of the year the market for rails was very narrow. The prices had been held well up and the material seemed to be in splendid demand, with some of the old orders not completed. The orders for 1903 delivery were also very heavy, taking up much of the capacity for the entire year. Some of the old orders, however, were never specified against, and many of the mills could induce little, if any, new buying. The result was that the market sagged materially all year and did not revive much in the fall. The talk of cutting down prices was a natural consequence, but this was held off, and by November the mills were ready to again quote $28, Pittsburg, as their price for 1904 delivery, upon which a certain amount of buying came out, though many of the consumers, especially the electric lines, held back.

Petzite was named after a German chemist, Petz. It is rare at Cripple Creek and not very common at Kalgoorlie, but it forms the characteristic telluride of a mine at Lake City, Colorado, called the Golden Fleece, which, between 1894 and 1896, yielded $1,400,000 from a comparatively small tonnage of ore. The average composition of petzite is: gold, 25; silver, 42, and tellurides, 33 per cent.

THE LAKE FREIGHT MARKET.

By Our Special Correspondent.

The season just closed has been one of rather unusual developments in the lake shipping trade. Some policies have been confirmed as being good, while others, which have been followed for years, have been discarded. The season has been one of strife and contention. For two or three years labor on the lakes has been more autocratic in its demands on vessel-owners. The general impression that anything connected with the lake industry requires an intricate knowledge of shipping has narrowed the labor market and has given the workmen a certain hold on the situation, further helped by the consolidating of mines. When the season opened last spring, organized unskilled labor on the lakes had to be dealt with very carefully, if work was to be permitted to proceed at all, and it was realized that somebody was needed to resist the demands made. With that end in view the Lake Carriers' Association, an advisory body, changed its plans and became an incorporated body with power to make contracts. An executive committee was appointed to deal with labor organizations. The ore-shovelers in the early spring were granted about every concession upon which they insisted. The subsequent meetings were about duplicates of the first, and finally excessive wages were paid. It has been estimated that the increased pay given all hands on shipboard, as a result of the incorporation of the Lake Carriers' Association, amounted to 7c. a ton on all of the ore brought down the lakes this season. No wonder the vessel-men were not long in declaring the organization they had created a failure.

The situation was complicated late in the spring by the formation of a newly-formed union among the masters and pilots, which started to find out how strong it was. The vessel interests were timid; the masters and pilots also found that they were not as strong as they supposed, and after holding out for a few weeks went back to work. The season opened much earlier than usual, but the three weeks' delay from the strike told on the lake shipments of ore, reducing the April movement greatly, and the loss was never fully regained, though in both July and August new tonnage records were made.

The beginning of the fall found unrest among all classes of labor on ship. Trouble seemed inevitable during the latter part of August, but was avoided by the careful management of the union leaders. The masters and pilots were not so easily soothed, and the radical element urged a renewal of the demands made in the spring. This led to more resistance by the Lake Carriers' Association against union demands, and for a while a serious split was imminent. Trouble was eventually avoided. The struggle between employers and employees was complicated by another and more serious one among vessel-owners. Shippers and vessel-owners, though banded in a common organization to resist the labor element on the lakes, were quarreling over freight rates at the opening of the season. Prices on iron ore had been advanced, and this seemed to warrant vessel interests asking higher rates. The ore-producers, however, were not disposed to grant this, but, through their ownership of the lake docks, asked rates for unloading that vessel-owners thought unfair. The result was that shipments at the opening of the season were delayed because the vessel-owners were unwilling to start their boats, until they had agreed with shippers as to rates. One or two of the big vessel interests held for $1 on ore from the head of Lake Superior to Ohio ports, while a few held for 90c. Finally about the first of May an agreement was reached on 85c. This was obtained during the first part of the year, on both wild and contract tonnage.

When the market opened, late in April, there was more ore on the docks than ever before at the opening, nearly 4,000,000 tons. In addition, sales were very light. It was thought that consumers would purchase more later, as many new blast-furnaces were being blown in, and early in May some of the wiseacres began to predict a movement of about 30,000,000 tons during the year. The vessels' interests computed the available carrying capacity, considered the loss of tonnage in April, and figured that the ultimate demand for vessel capacity would be unprecedented. It was with some surprise, therefore, that they heard about the middle of May that ore shippers had determined to break the rates on wild cargoes from the head of the lakes to Ohio to 80c. and a league was formed among the larger owners to combat the movement. But about that time the boats carrying package freight, which had been looking in vain for a certain proportion of grain for bulk, went after iron ore, and the Lumber Carriers' Association, an organization of small vessel-owners, which was having trouble with the shippers over the rate on lumber, began taking ore at the lower rate in preference to tieing up cargo. These two classes of boats beat down the wild rate to 80c.

It began to appear that the demands for ore were not going to be as heavy as had been at first anticipated, and the opinion grew that the vessel tonnage available was vastly in excess of the demands. Rates did not fall because many boat-owners declared they would tie up their unloaded boats to the dock rather than take lower ore rates at the prevailing cost of operation.

About the first of June congestion at the docks began, and many vessel-men found that about all of their profits were eaten up by delays, the average waiting being about five days. It is estimated that these delays virtually amounted to a reduction of 15 per cent of the tonnage of the lakes during the entire season. Coincident with these delays, a record was made in the quantity of ore brought down the lakes during July. The average rate on ore for the season, as figured by the *Marine Review*, is 80.9c., whereas the contract rate was 85c. from the head of the lakes to Ohio.

For the first time in several years the showing at the end of the season is detrimental to the railroads, substantiating the claim that they have not been equal to the task of moving the ore from the docks as fast as the boats brought it down. The total movement for the season shows a lake movement of over 3,850,000 tons less than in 1902; yet the amount of ore on the docks, December 1, this year, is only about 600,000 tons less than a year ago. The blame is not all with the railroads, as the furnace docks were frequently not in shape to take the ore, and the railroads could not have moved it had they desired to.

Lake coal shipments felt many of the conditions which governed the ore trade, the labor difficulties and the early delays. Coal dealers in the Northwest, who in 1902 received little or no hard coal until late in the fall, were in need when the spring opened, and the trains of coal began to arrive at lower lake docks about April 1, and some boats were loaded while the rivers were yet full of ice. The labor difficulties kept these boats in port until late in the month, when a stream of coal began to move up the lakes. The speed of shipment has probably never been excelled. About June 15 the vessel-owners, on account of their boats being delayed at the ore-docks, decided to put a few of the boats in the coal trade. Soon berths at all coal docks were filled with boats, shipments increased, and railroads, being better equipped with cars and locomotives and less bothered for track space, hurried the coal forward. Still the vessel tonnage offered soon became so heavy that the market was inclined to sag off. But, although there has usually been a big midsummer fight between shippers and vessel-owners over rates this year, the coal men held rates firm through July. The vessel-men, when the market got soft, vowed they would send their tonnage to the docks rather than accept lower freights, and rather than have the supply of available tonnage limited the shippers consented to pay, through the summer, the rates established in the spring. As a result, before August 1 the upper lake docks were congested with coal, the railroads being unable to carry it away fast enough, and the delays were serious. The Canada situation seemd to offer a little relief for a short time, but vessel-owners soon found that the Canadian docks were being congested, too. Notwithstanding these conditions, rates held firm, and did not change until late in the fall, when a few stray cargoes were taken at a slight advance. The average rate was 50.5c. to Milwaukee from Ohio ports, whereas the contract rate at the opening of the season was 50c. per ton.

The production of coal in Ohio has been greater in 1903 than in 1902. There have been new mines opened, and many old mines have put in improved machinery. Toward the end of November a conference of the operators was called in Cleveland to plan, if possible, a reduction in the output of the State, to bring it down to requirements. The figures compiled by the railroads showing the movement to the lakes give an aggregate of 14,732,976 tons, not including vessel fuel coal. This movement compares with a shipment of about 11,000,000 tons for the preceding year. The figures which are compiled by the railroads show that the output for the year in Ohio was about 1,000,000 tons more than in 1902.

MAHONING MINE, MESABI RANGE, MINNESOTA.

THE EASTERN PENNSYLVANIA IRON AND STEEL MARKET IN 1903.

By Our Special Correspondent.

Pig Iron.—Prices for pig iron at the opening of the year were approximately as follows: No. 1 X foundry, $25 to $24; No. 2 X foundry, $23; No. 2 plain, $22 to $22.50; gray forge, $21; Middlesbro No. 3, $21 to $21.50; Scotch, $22.50 to $23. A slight upward tendency was manifested and American consumers were looking abroad to find relief. Trade conditions were generally favorable, and consumers were endeavoring to accumulate stocks against the probability of advancing prices. Work was freely coming in; inquiries were numerous; brokers and furnace representatives were forcing production, and all indications pointed to a season of exceptional activity.

The depression which was soon to appear manifested itself only to a few careful and experienced

observers. Business conditions, toward the opening of spring, began to alarm the more observant, and the anticipation of requirements was less urgent. It became whispered around that the great increase in productive capacity would probably not be as promptly absorbed as it had been. The appearance of labor troubles, followed by the side-tracking of quite a number of important enterprises, introduced the policy of hand-to-mouth buying among the more cautious buyers; this policy was gradually extended during the spring months, and was continued into the early summer months by all classes of buyers. The result was that by July pig iron quotations ranged about as follows: No. 1 X foundry, $20 to $20.50; No. 2 X foundry, $18.50 to $19; No. 2 plain, $18; standard gray forge, $18 to $18.25; ordinary gray forge, $17 to $17.50; basic, $18 to $18.50.

Unfavorable conditions became more aggravated as the summer progressed, hand-to-mouth buying continued, symptoms of accumulations of stock became more pronounced, but with all there was quite a heavy consumption. By October prices had sagged down to about the following figures: No. 1 X foundry, $17 to $17.50; No. 2 X foundry, $15 to $16; No. 2 plain, $15; standard gray forge, $14.25 to $15; basic, $14.50; low phosphorus, $21 to $22.

The threatening conditions of the spring and summer, by this time, had produced general distrust, and consumers everywhere recognized that the pig-iron industry was on a down grade, the end of which was not in sight. The hope was entertained by furnace interests that consumers, who had ordered heavily, would continue to call for deliveries according to contract. The curtailment of output, which had been inaugurated during the summer, had very little effect upon the market or none at all. Consumers began buying in a very small way, finding that each successive purchase was made on more favorable terms. It was recognized that a vigorous curtailment would have to be speedily made if bargains were to be maintained, but there was a hesitancy on the part of producing interests to recognize the trend of the trade, and radical measures were postponed. All quotations were suspected, and rightly so, for the market continued to sag. By the close of the year, the full weight of the depressing influences were felt. The energetic measures made to restrict production failed to check the declining tendency, but at present writing there appears to be some hopeful reasons for anticipating a reaction. The strongest feature in the situation at present is the absence of stocks in consumers' hands and the anxiety of all consumers to carry moderate stocks as soon as bottom prices have been assuredly reached. Quotations at the close of the year were substantially as follows: No. 1 X foundry, $16 to $16.50; No. 2 X foundry, $15 to $15.50; No. 2 plain, $14.50; No. 2 southern, rail shipment, $13.25, or on dock, $13; standard gray forge, $14; basic iron, $14. It should be observed, however, that these quotations represent only average prices, surprising variations being quite frequent, especially below those quoted.

Billets.—The oversold condition of the billet mills at the opening of the year necessitated considerable importation, and during the closing months of the previous year billets were freely imported on a basis of about $27.50. The heavy consumption during the winter and early spring strained the capacity of mills, and prices were fairly maintained, being held about midsummer at $29, f. o. b. eastern mills. Depressing influences, however, had already begun to manifest themselves, because of the serious interruptions by labor disturbances and general distrust, and the previous policy of liberal forward buying had received a check from which it did not recover. A declining tendency set in, which reduced quotations for steel as low as $26, though in some cases $27 and $27.50 were paid. By the close of the year the declining demand, and the greater ability of mills to fill orders, promptly depressed steel quotations, and they were given at $24 to $25. At present writing there is a suspicion, which seems to have good foundation, that billets will break in price to a marked extent.

Bars.—The bar iron trade opened strong, under a steady demand and heavy consumption, and mill capacity was pretty fully engaged; but by the opening of spring a depressing tendency had manifested itself, which stimulated competition among mill-owners, and which, by the opening of summer, had depressed quotations to 1.75 at mill for car-lots of refined and to about 1.70 for steel. By the close of the year bars had declined to 1.40 for best refined, and even less money was snapped at, while steel bar orders were sought for urgently at 1.45 in car-lots.

Sheets.—The sheet iron market opened very strong, and orders were freely crowded in, taxing the capacity of mills; this continued throughout the winter and spring. The sheet iron industry escaped much of the depression which other branches of the industry suffered.

Plates and Structural Material.—At the opening of the year there were some symptoms of trouble in this branch of the iron trade, although tonnage was quite heavy, and the larger mills were sold months ahead. Toward the opening of spring apprehensions were shown to be well warranted, by the side-tracking of a number of important enterprises into which shapes and plates entered. Railroad building enterprises, which seemed to call for very large quantities of material, were postponed, and orders began to drop off, while smaller supplies were called for. A hand-to-mouth policy set in, especially as it became known that the mills had practically caught up the demand and that lower quotations were probable. The manufacturers of these materials, however, refused to shade prices, and the entire season passed with no pronounced reduction in prices to the general trade. During the autumn months a depressed feeling manifested itself, accompanied by demands on the part of consumers for sharp reductions, which have not yet been made.

Merchant Steel.—The course of the merchant steel industry throughout the year was rather even, considering fluctuations in other branches, and nothing of serious moment disturbed its equanimity, although shaded quotations were progressively made.

Steel Rails.—Steel rails continued at $28 throughout the year, and productive capacity has been maintained at maximum limits. At the present time there is a strong sentiment on the part of consumers for marked reductions, which they still hope will be conceded.

Scrap.—The demand for scrap at the opening of the year was heavy, and dealers found difficulty in meeting the requirements of customers at high prices. By the opening of spring, prices had declined somewhat, and by midsummer serious reductions were made, because of declining demand and accumulating stock. Old iron rails were offered at $24; old steel rails at $21; heavy steel scrap at $20; choice railroad No. 1 wrought, $21; country scrap, $19.50; No. 2 light scrap, $18.50. At the close of the year quotations meant next to nothing; old iron rails were offered at $16; old steel, $12; heavy steel scrap, $12; choice railroad No. 1 wrought, $15.50; country scrap, $14; No. 2 light scrap, $11.50. At present writing there are evidences of a general improvement in demand, partially owing to the dangerous condition into which consumers have permitted themselves to slide.

Mountains are the focal points of geological interest. In their complex structure are contained all kinds of rock, sedimentary, eruptive and metamorphic; and in their formation are engaged all geological forces in their greatest intensity. They are the culminating points, the theatres of greatest activity of all geological agencies; igneous agencies in their formation, aqueous agencies by sedimentation in their preparation, and by erosion in their subsequent sculpture.

COAL IN 1903.

By SAMUEL SANFORD.

The world's production of coal in 1903 showed a decided increase over the great total of 1902, much the larger part of the increase coming from the United States, and being due to the heavy production of anthracite in Pennsylvania. The total output of the world now approximates 845,000,000 metric tons, of which the United States produces over one-third, and in spite of temporary checks on output at various points, owing to the unsettled industrial conditions, labor troubles, etc., there is little reason to believe that the output for 1904 will show a decrease. The developments in the principal coal-fields of the world during the past year were as follows:

Asia.—Comparatively little has been done in the great Chinese coal-fields, although mines tributary to points on the Eastern Chinese Railway have been fairly busy. In Japan mining has been active, and the coal production of 1903 should show a considerable increase over 1902, and is probably the largest on record. India is recovering from the depression caused by plague and famine, the coal mines are busy, and the output will undoubtedly show an increase over 1902.

Australia and New Zealand.—Australia still feels the depression caused by the long drought, and in addition has suffered during the year from labor troubles. As a result, coal-mining has been hampered, and the output for 1903 will probably show little increase over the 1902 total of 6,856,590 long tons. The principal Australian coal-mining States are New South Wales and Queensland. New Zealand coal mines have had a good year, and the output should exceed the 1902 figures.

Africa.—In spite of the shortage of labor in the Transvaal, there has been a decided increase in gold mining, and consequently a better demand for coal for the mines and the railroads connecting them with the coast. The principal coal mines in Africa are in the Transvaal, Natal and Cape Colony, and the chief increase in output during the year has been from the Transvaal mines. The returns of the Transvaal Mining Bureau indicate a total production of 3,250,000 short tons for 1903.

Europe.—Of the chief coal producing countries in Europe, both Russia and Austria-Hungary have suffered from industrial depression and other labor troubles, and Russia will show a smaller output than the 1902 output of 15,488,934 metric tons, probably not far from 15,000,000 metric tons. The output of Austria-Hungary may show a slight increase and amount to 33,250,000 metric tons of coal and lignite. The 1902 output was 33,184,722 tons. The principal Russian coal-mining districts is in the Donetz basin, and the principal Austro-Hungarian mines are in Bohemia. In Germany industrial activity has increased, with a corresponding improvement in coal mining. Returns made by the government for 11 months of the present year indicate a total production of 161,600,000 metric tons of bituminous coal and lignite in 1903, compared with 150,436,810 tons in 1902. The principal German mines are in Prussia. The output of the Belgian mines in 1903 was about 22,000,000 metric tons. In France the output was probably larger than in 1902, but less than in 1901, the total production being not far from 32,000,000 metric tons.

In Great Britain, at the beginning of the year, mining was quite active in the district shipping coal for export, partly due to an extraordinary demand from the United States as a result of the miners' strike in Pennsylvania. This demand fell off quickly, however, and during the greater part of the year the British coal markets have been quiet, with demand rather slack. The total output of the British collieries for 1903 will probably show a small gain over 1902, and will be nearly 230,000,000 long tons.

Canada.—Various Canadian coal-mining regions have had troubles of various kinds during 1903. In British Columbia the collieries at Westminster, on Vancouver Island, were tied up by a strike for sev-

eral months. At the mines recently opened at Frank, in Alberta, a disastrous slide of rock partly destroyed the town and crippled the mines. The mines of the Crows' Nest Pass Coal Company at Fernie and Morrissey were tied up by strikes early in the year, but production was heavy the last half of the year. The total output of the province was about 1,600,000 long tons.

In Nova Scotia the mines were busy at the beginning of the year, due to the demand from the United States. In March one of the Dominion Coal Company's mines caught fire and had to be flooded, stopping its output for several months. All Nova Scotia mines worked less actively in the summer and fall. The total output of the province was probably 4,600,000 long tons.

Mexico.—There was considerable exploration and development in the coal-fields of the Republic during the year, and the outlook for a considerably increased production for 1904 is excellent. The principal mines in Mexico are in Coahuila.

United States.—The United States made a much larger increase in coal production during 1903 than any other country in the world. This increase, as noted before, was due chiefly to the heavy production in Pennsylvania. Owing to the unprecedented demand for fuel during the last half of 1902, production during the early months of 1903 was very heavy all over the country. Demand slackened in the summer and fall, yet, in spite of this, but few States will show a decline from their record-breaking outputs of 1902. Labor troubles restricted the total output but little, the only States to suffer being Alabama, Utah and Colorado. But even in Colorado the check to production was not general enough to reduce the output below the 1902 figures. The strike in the State was due entirely to the activity of the Western Federation of Miners, who got the coal miners to strike in an abortive attempt to cripple the precious metal mines and reduction works.

There were no changes in the relative rank of the chief producing States, though there were considerable changes among some of the lesser producers. Pennsylvania maintains its great lead over all coal-producing States. The anthracite mines owing to the unprecedented demand early in the year made the great output of 73,315,000 short tons, which compares with 67,471,667 tons in 1901, the best previous year. In the bituminous fields an enormous amount of development work was carried on, much new equipment was installed, and the output exceeded that of any previous year. Only in the southern districts of Somerset county, was the slackening demand of the fall felt severely. The percentage of increase was heaviest in the Pittsburg region, and from the mines reached by the New York Central railroad. The total output of bituminous coal was 108,300,000 short tons, compared with 98,946,203 tons in 1902, and the total output of the State 181,615,000 short tons, compared with 139,587,132 tons in 1902. Pennsylvania actually produced more coal than Germany, the third largest coal-producing country in the world, omitting that country's output of briquettes.

Illinois had a prosperous year, and the output of its mines was the largest on record. The total production was 34,955,073 short tons, compared with 30,021,300 tons in 1902. West Virginia coal mines were very active during the beginnig of the year, but during the late fall the output of the mines shipping to tidewater felt the slackened demand. The output of other mining districts was less affected and the total output of the State for the year was 26,883,526 short tons, compared with 26,162,173 tons in 1902.

Ohio coal miners were pretty busy throughout the year. The total output of the year is estimated at 26,250,000 short tons, compared with 23,929,267 tons in 1902. Of the other coal-mining States, Maryland felt the slackening demand during the fall, while many mines are approaching exhaustion, and failed to maintain its relative rank as a producer. On the Pacific coast Washington benefited by the strikes in British Columbia, but its coal mines have felt and will feel the competition of fuel oil from California.

COAL MINING IN ALABAMA IN 1903.

(BY OUR SPECIAL CORRESPONDENT.)

The estimates made early in the year of the probable coal output for 1903 are not far out of the way. They would have been closer had not mining in Jefferson county, the largest coal producing county in the State, stopped for a month in July on account of the United Mine Workers of America, who control the labor in the mines in this State, failing to come to an agreement with the Alabama Coal Operators' Association. The differences were finally submitted to a board of arbitration; the coal operators selected two members of the board and the miners two, and Judge Gray, of Delaware, acted as chairman. The board was in session two weeks, and its award was a compromise. The miners secured the concession of semi-monthly pay-days; the maximum rate for mining was increased to 57.5c. per ton, and the minimum fixed at 47.5c., both being increased 2.5c. The production of coal resumed its usual proportions early in August. It had been heavy up to July, and after August 15 showed a decided increase over what it was before the shut down. In Walker county mining did not stop during the year, and coal from mines in that section was used to fill some of the orders filled previously from Jefferson and Bibb counties. The coal output of Alabama during 1902 amounted to 10,329,479 tons, and for 1903 it is estimated at about 12,000,000 tons. Had there been no cessation of work this year, the production would have gone above 12,500,000 tons.

Several new coal companies were organized in 1903, and some of them have begun work, while others are preparing to begin. Several railroad extensions were built to reach coal-fields about to be developed, one being built by the Southern Railway to reach the mines of the Sloss-Sheffield Steel & Iron Company at Flat Top, where over 1,000 men are given employment. The Louisville & Nashville Railroad is extending its lines in the western part of Jefferson county, where already 50 cars of coal are being mined daily, and a number of new mines are in contemplation.

In other coal-fields, producers have asked for further construction by the railroads, and surveys have been made in Bibb county to accommodate three new mines now being mapped out. In 1902 the Alabama coke production was 2,210,735 tons, from 7,168 ovens, many of which, however, were not in operation through the whole year. It is expected that the 1903 output will be at least 2,500,000 tons. The outlook for the year 1904 is bright.

PRODUCTION OF COAL IN THE UNITED STATES.

Bituminous.	1902. Short tons.	1902. Value at mine. Total.	1902. Value at mine. Per ton.	1903. Short tons.	1903. Value at mine. Total.	1903. Value at mine. Per ton.
Alabama	10,329,479	$12,498,669	$1.21	12,000,000	$14,880,000	$1.24
Arkansas	2,125,700	2,328,270	1.10	2,337,000	2,687,550	1.15
Colorado	7,455,156	8,349,768	1.12	7,651,598	9,564,498	1.25
Illinois	30,021,300	28,272,050	0.94	34,955,073	36,353,276	1.04
Indiana	8,763,197	8,237,405	0.95	10,515,816	10,515,816	1.00
Indian Territory	2,741,797	4,386,875	1.60	3,400,000	5,610,000	1.65
Iowa	5,407,144	7,908,004	1.46	5,900,000	9,322,000	1.58
Kansas	5,229,767	7,321,674	1.40	5,875,000	8,812,500	1.50
Kentucky	6,429,419	6,107,948	0.95	7,075,000	7,075,000	1.00
Maryland	5,525,785	6,225,639	1.13	4,400,000	5,500,000	1.25
Michigan	869,228	1,173,458	1.35	1,561,678	2,108,265	1.35
Missouri	4,067,166	5,324,788	1.31	4,600,000	6,716,000	1.46
Montana, Wyoming and North Dakota	6,723,909	9,232,953	1.37	6,750,000	9,450,000	1.40
New Mexico	1,090,373	1,537,426	1.41	1,515,000	2,196,750	1.45
Ohio	23,929,267	24,843,608	1.08	26,250,000	30,187,500	1.15
Pennsylvania	98,946,203	106,861,899	1.08	108,300,000	124,545,000	1.15
Tennessee	4,232,332	5,278,921	1.25	4,937,000	6,269,990	1.27
Utah	1,641,436	2,068,209	1.26	1,700,000	2,210,000	1.30
Virginia	3,070,104	3,223,609	1.05	2,800,000	3,080,000	1.10
West Virginia	26,162,173	27,208,660	1.04	26,883,526	29,571,879	1.10
Other States	4,064,249	7,509,476	1.85	4,000,000	7,400,000	1.85
Total bituminous	258,825,184	$285,909,309	$1.10	283,406,691	$334,056,024	$1.30
Anthracite.						
Pennsylvania, New Mexico and Colorado	41,451,267	83,002,229	2.00	73,390,000	150,449,500	2.05
Grand total	300,276,451	$368,911,538	$1.23	356,796,691	$484,505,524	....

COAL MINING IN ILLINOIS.

BY OUR SPECIAL CORRESPONDENT.

The latest official data to be had on the coal production of Illinois are for the fiscal year ending June 30. That was the biggest year in the coal industry of the State, excelling all former years in output, number of mines, number of employees, and, by a large percentage, in the number of fatalities. The production for the year was 34,955,073 net tons of coal, as against 30,021,300 tons for the year before, an increase of 4,933,773 tons, or 16.43 per cent. This is the largest increase for over 20 years, and the largest percentage of increase for over 10 years, except for 1899, when the increase of 26 per cent was caused by the strike of '98.

The average number of days the mines were in operation was 224, as against 179.6 the previous year. The number of mines in operation was 935, as against 915 in each of the two previous years, and 920 for the year ending June 30, 1900. The large increases in production, number of mines and average number of days worked were caused not only by the steady increase in demand due to the general prosperity of the country, but also, during the summer and fall of 1902, by the strikes in the anthracite regions and in the West Virginia, and many people in Chicago and the Northwest, who imagined they could use nothing but anthracite coal, are now using Illinois and Ohio coals.

The number of men employed for the year was 34,995 miners and 14,684 other employees, making a total of 49,679, as against 32,875 miners and 13,130 other employees, a total of 46,005, for the previous year. The average production per day per mine was 167 tons, and per day per man 3.14, as against 183 tons and 3.63 tons, respectively, for the previous year. This would tend to show that the efficiency of the men is decreasing, due, no doubt, partly to the 12½ per cent increase in wages made April 1 last.

The aggregate value of the output of the mines for the year ending June 30 was $36,442,917 at the mines, or $1.043 per ton, as against $28,272,050, or $0.942 per ton the year before. This increase in price was due to the stronger demand, to the abnormal prices paid for free coal during part of the winter of 1902-03, and to the advance in miners' wages.

In the year under consideration, there were 510 machines used to mine 7,832,964 tons of coal, or 22.4 per cent of the total product, as against 464 machines, to mine 6,497,123 tons, or 21.6 per cent of the total output the year before. The slight increase in the percentage of machine-mined coal is due to the differential in the mining wage scale being so small as to offer little inducement to operators to use machines, it being only 7c. per ton, except in the Danville district, where it is 10c. per ton.

The number of fatal accidents for the year was 156, or 3.14 per 1,000 employees and one for each 224,071 tons produced. This compares with 99 in the year before, or 2.37 per 1,000 employees, and one for every 303,245 tons produced. The increase in the percentage of fatalities is undoubtedly due largely to an increase in the extravagant and reckless use of powder in blasting, because of the run-of-mine system of paying miners. The State legislature at its last ses-

sion passed a law, drawn up by a committee of operators and miners, limiting the amount of powder to be used in one blast and prohibiting the firing of dead holes. This helped the matter some, but there is still much room for improvement.

The year 1903-1904 promises to exceed in production the year 1902-1903. The past summer has been an exceptionally good one in the coal business, though in the early fall car supply was poor, and transportation by the railroads exceptionally slow. Over 100 large new mines are now being sunk or developed in various parts of the State, while very few will be abandoned, but many operators, especially those with large mines, are wondering where the necessary men and railroad equipment will come from.

The writer is indebted to Mr. David Ross, secretary of the State Bureau of Labor Statistics, for the data used in the preparation of this review.

INDIANA COAL MINING IN 1903.

By Our Special Correspondent.

The total production of coal for 1903 is estimated at 10,515,816 gross tons, an increase of 1,752,639 tons, or 20 per cent, over 1902, and the largest output on record. The increase is due to the increasing demand for Indiana coal and the failing supply of natural gas; the introduction of coal mining machinery, mechanical lifts, etc., in the established mines, and the unusually large increase in the number of mines opened during the early months of the year. The production would have been much greater, especially during the last few months, but for the limited ability of the railroads to move the coal. The car shortage, with alleged discrimination of the railroads, led operators to call the attention of State officials to the situation.

The market price for coal during the year has been good and steady. In Sullivan and Greene counties, the two most productive, the mine price has been $2.25 for lump and $1.75 for run-of-mine. This price was reduced 25 cents December 15. Corresponding prices prevailed in the block coal regions of Clay and adjoining counties. The estimated wages paid in 1903 amounted to $8,477,286, an increase over 1902 of $1,061,837, or nearly 15 per cent. The total number of mine employees was 14,696. Much new machinery has been installed, and modern equipments are to be found in nearly all of the mines. Few mines have been abandoned, while the year will end with about 30 new mines opened.

Never in the history of the State has capital been so eager to invest in coal lands. It is estimated that 40,000 acres of land has been purchased, but in most instances the purchase includes only the coal, with adequate surface rights to mine the same. Better transportation facilities are promised. Three steam roads and two interurban electric roads are now being built into the coal-fields.

There were few strikes or labor troubles of any consequence. The year has been the best in the history of Indiana coal business, and the prospects for 1904 are still more promising.

IOWA COAL MINING IN 1903.

By S. W. Beyer.

Returns from 11 of the leading coal producers in the State, representing all of the districts, show an increase in price for 1903 over 1902, ranging from 6 per cent in Jasper county to 25 per cent in Appanoose and Webster counties. The increase in price is largely due to the higher mining cost, and the miners and operators share about equally the results. Fully three-fifths of the coal mined in the State is consumed by the railways, and the uniform advance in price of coal contracted for by the railways is $0.25. The price of coal sold locally fluctuates, and will show but little change from last year. The average increase on the total output will probably be about $0.125 per ton.

Most districts report but little change in output. During the year about 20 coal companies went out of business, some of them being absorbed by other companies and some abandoning their mines. About 15 new companies have started, so that the number of mines in operation in 1903 differs little from the 1902 total. Monroe and Marion counties show a large increase in production, Polk and Boone a lesser increase. The total increase for the State will amount to 400,000 or 500,000 tons. The 1902 output, according to the best figures available, was 5,527,263 tons, and sold for $8,058,799, or an average of $1.46 per ton. The 1903 production will be about 5,900,000 tons, selling for about $9,322,000, or $1.58 per ton. All of the shipping mines have been running almost full time throughout the year; the average number of days for 1902 was 218, and for 1903 will probably reach 225 or better.

WEST VIRGINIA COAL IN 1903.

By James W. Paul.

The year 1903 opened with an unusual demand for coal, and, with the abnormal price received early in the year for all grades, the business of coal mining in the State has never been better or more profitable to those who were not shipping under old contracts. The first six months of the year there were mined 13,002,255 long tons of coal, and there were manufactured 1,409,390 tons of coke.

During the last six months of the year a scarcity of railroad cars at the tipples and a lessened demand for both coal and coke materially reduced the tonnage. A conservative estimate of the coal produced for the latter half of the year will be 11,000,000 long tons, and of coke 1,000,000 tons, making the production for the year: Coal, 24,002,255 long tons; coke, 2,409,390 net tons.

An idea of the progress made within recent years may be had when it is stated that the coal production of the first six months of the year was 1,296,426 tons in excess of the State's production for the entine year 1897, and the coke production for the year 1897 was less than for the first half of the year 1903 by 34,893 tons.

The detailed report for the fiscal year ending June 30 reveals the production for that period to be: Pick-mined, 16,600,804 tons; machine-mined, 6,312,894 tons; total, 22,913,698 long tons. Of this amount, 266,691 tons were used for steam purposes at the mines, 210,273 tons were sold to the local trade, 3,774,674 tons were manufactured into coke, and 18,662,060 tons were shipped to points mostly out of the State.

This production was distributed as follows:

District.	Tons.
Potomac	1,662,068
Monongahela	6,679,000
Wheeling	503,925
Kanawha-New river	6,540,325
Norfolk and Western	7,388,380
Small mines	180,000
Total	22,913,698

The largest producing companies, in their order, were: Fairmont Coal Company, 3,580,604; Davis Coal & Coke Company, 1,341,265; Kanawha & Hocking Coal & Coke Company, 709,753; Norfolk Coal & Coke Company, 591,982; Red Jacket Coal & Coke Company, 506,443; Clarksburg Fuel Company, 477,176; Crozer Coal & Coke Company, 274,381; Houston Coal & Coke Company, 272,736; Junior Coal Company, 265,855; Turkey Gap Coal & Coke Company, 254,352; Empire Coal & Coke Company, 253,607; a total for 11 companies of 8,528,154 tons.

There were seven other companies, each of which produced over 200,000 tons; and 44, each of which produced over 100,000 tons, but less than 200,000.

From the above statement, it may be seen that 11 companies produced 37 per cent of the State's output and more than the entire State for 1892.

The mine which produced the greatest tonnage was the New England, in Marion county, belonging to the Fairmont Coal Company. This mine produced 305,120 tons from one opening, a drift.

The machines used numbered 795 for 1903, an increase of 261 over the previous year, and the firms using them were 181, an increase of 57.

The tons of machine coal increased from 5,135,823 to 6,312,894, an increase of 1,177,071 tons; while the pick-mined coal decreased 1,622,456 tons. In the operation of the machines, there were employed as runners, helpers and loaders 6,531 men inside of the mines.

There were employed in the mines 16,287 pick miners, 6,531 machine men, 7,632 inside laborers, making a total of 30,450 inside; 3,851 coke workers, 5,151 outside laborers, a total outside of 9,002, or a total of all kinds of labor at the mines of 39,452.

The mines in the State worked on an average of 213 days during the year, and the coke ovens 223 days. The average price paid for mining run-of-mine pick coal was 49.5c. per ton, and trackmen received $2.02 per day. These are the highest averages of wages paid within the State of which this department has any record.

The average price received at the mines per ton of 2,240 lb. for run-of-mine coal was $1.32 2-3, and for coke per ton of 2,000 lb. $2.66¼. The price at the close of the year for coal is $1 to $1.15 to open markets and as low as 95c. on contract.

The State has had its share of the fatalities incident to coal mining, and during the year there were killed within the mines 147 persons; on the surface, 12 persons, or 4.82 persons to each 1,000 employed inside, and 1.33 persons to each 1,000 employed outside.

About 75 per cent of the fatal accidents on the outside of the mines were due to mine-cars, and for the past 11 years 79 per cent of all fatal accidents inside of the mines were due to mine-cars and falls of roof.

There was an increase of 84 shipping mines. The development throughout the State is unsurpassed by any previous year. Many large tracts of coal lands have been acquired by corporations and individuals, and large tracts of mineral rights have been secured by prospective operators. Kanawha county has probably contributed the greatest development. At least 45 mines have been opened on the several tributaries of the Great Kanawha river east of Charleston, notably on Cabin, Paint and Kelleys creeks. The developments on Tug river are especially of importance. Here the United States Coal & Coke Company has opened six mines, and has in process the completion of a shaft and several additional drift mines. Fifteen hundred coke ovens have been completed, and as many additional are in contemplation. At Gary is located the central electric power plant, which is the largest unit of any power plant within the State.

Considerable development has been made in Fayette county, where several shafts are under progress to reach the New River coals at points south of the New river cañon, where these coals are below drainage. In the Belington field many substantial improvements have been made, and the producing capacity of the mines much enlarged. In the counties contiguous to Wheeling there has been great activity, and new mines are being developed at a considerable cost.

The activity in the betterment of railroad facilities, the extension of feeder lines and the construction of new lines, all have an important bearing upon the future of the State as a coal producer. With favorable market conditions and good transportation facilities, the mines now in operation could easily produce 45,000,000 tons in one year.

PITTSBURG DISTRICT COAL IN 1903.

By Our Special Correspondent.

The production of coal in the Pittsburg district in 1903 exceeded expectations and was the heaviest on record. According to the best data available, the output for the year, December being estimated, was over 30,000,000 tons, or about 5,000,000 tons ahead of 1902. The capacity of the leading companies greatly increased, but shipments were not as large as they would have been had the railroads been able to furnish more cars.

A determined and successful effort was made by the Pittsburg Coal Company to fill its contracts for the northwestern market. Coal was rushed to the lake

ports from the opening of the season on April 1 to its close on December 5, and the company sent out a vessel on December 7. The company sent up the lakes 4,500,000 tons, or 1,200,000 tons in excess of the season of 1902. The total production of the Pittsburg Coal Company for the year is given at about 18,000,000 tons; this includes the output of the companies controlled, which are the Midland Coal Company, 600,000 tons; New York & Cleveland Gas Coal Company, 1,600,000 tons; Shaw Coal Company, 400,000 tons; and Mansfield Coal & Coke Company, 400,000 tons. The production of the Monongahela River Consolidated Coal & Coke Company, the river combination, is reported to have been 7,500,000 tons. Of this amount, 2,000,000 tons were shipped by rail and the rest by water. Of the river shipments, fully 2,500,000 went to local markets and 3,000,000 tons to southern ports.

Several important deals were made by the Pittsburg Coal Company during the year. In January it took over the Midland Coal Company, operating three mines and owning 5,000 acres of valuable coal-land in the Panhandle field. The property of the Mansfield Coal & Coke Company, which included one mine, 1,000 acres of land and a number of individual railroad cars, was taken over in November. The majority of the stock of the Monongahela River Consolidated Coal & Coke Company was purchased in October through George I. Whitney, of Whitney & Stephenson, stock brokers, and the company took possession the following month, but the full details of the deal will not be officially announced until the annual meeting in January.

The Pittsburg & Buffalo Company, the largest independent concern in the Pittsburg district, and its constituent companies, the Manufacturers & Consumers Coal Company and the Johnetta Coal Company, were consolidated in December and the name changed to the Pittsburg-Buffalo Company. A Pennsylvania charter was secured and the company capitalized at $6,000,000. The company is composed of members of the Jones family, and its affairs are directed by John H. Jones. The production in 1903 was 1,500,000 tons, but the capacity of the mines will be increased from 50 to 60 per cent in 1904 and doubled in 1905. The company owns the Hazel mine at Canonsburg, the largest coal mine in the district, two mines at White Rock, on the Allegheny Valley Railroad, three mines on the Baltimore & Ohio Railroad, one on the Monongahela division of the Pennsylvania Railroad, and one on the Pittsburg, Cincinnati & St. Louis Railroad. Eight new mines are being opened on the Monongahela division and on the Baltimore & Ohio and the Wabash railroads.

J. W. Ellsworth & Co., the next largest independent concern, operating five mines at Ellsworth, produced 1,000,000 tons. The Pittsburg Railroad Terminal & Coal Company is a new concern. It purchased 7,000 acres of coal-land in the heart of the Pittsburg district and opened seven mines. These are not yet operated to their capacity, but during the year produced about 400,000 tons. The United Coal Company produced 750,000 tons at its five mines; the Hazel Kirk Coal Company, with two mines, 300,000 tons; Charleroi Coal Company, one mine, 300,000 tons; Carnegie Coal Company, two mines, one just opened, 200,000 tons; Meadowlands Coal Company, two mines, one recently opened, 200,000 tons; Osceola Coal Company, one mine, 160,000 tons, and about a dozen other independent concerns with annual production of less than 150,000 tons, 1,000,000 tons.

The joint annual convention of the United Mine Workers and the operators of Pennsylvania, Ohio, Indiana and Illinois, parties to the inter-State agreement, agreed in January on a new mining rate for the year beginning April 1. This provided for an advance of 12½ per cent for pick mining, fixing the price at 90c. a ton for coal over a 1¼-in. screen; 16 per cent advance for machine miners and 21 per cent for drivers. There was a great scarcity of coal in January as a result of conditions in 1902, and run-of-mine coal brought from $6 to $7 a ton. Contracts for the year were made at good prices, but in the fall there was a heavy decline, and in December run-of-mine coal sold as low as 90c. at the mine. The mine prices for the year averaged $1.70 for run-of-mine; $1.90 for 1¼-in.; $1.80 for ¾-in., and $1.15 for slack. Special rates amounting to 30c. less than the circular prices were given to the United States Steel Corporation and other large steel concerns. One of the largest contracts of the year was made in May by the Pittsburg & Buffalo Company with the Pennsylvania Railroad Company. It called for 500,000 tons a year for three years. A contract was also made by this company with the Baltimore & Ohio Railroad for 200,000 tons annually for three years.

THE ANTHRACITE TRADE.

A record-breaking output and higher average prices than since 1875, combined to make 1903, a memorable year in the history of the anthracite coal trade. It is quite possible that the year may be without an equal for some time to come, since the output and high level of prices were both a direct outcome of the great strike of 1902, and were thus in a way abnormal.

There were few changes of importance in the ownership of great properties, except those already indicated by the events of previous years, which were outlined in Volume XI. of '*The Mineral Industry*.' The tendency toward the consolidation of interests has gone unchecked since J. P. Morgan undertook the reorganization of the Erie and the Philadelphia & Reading railroads, but present indications are that this consolidation will not go much farther. The most important change announced during the year was the transfer of a very large block of Philadelphia & Reading stock, probably a controlling interest, to the Baltimore & Ohio and the Lake Shore railroads, these roads receiving the stock in order to avoid conflict with the provision of the Pennsylvania constitution which forbids a railroad acquiring a controlling interest in a competing line. As a large amount of Baltimore & Ohio stock is probably held by the Pennsylvania, this last deal virtually gave the latter a controlling influence in the anthracite trade. It also signalized the retirement of J. P. Morgan from the position of power that he had held for several years. Another event of importance was the retirement of the venerable president of the Delaware & Hudson Company, Mr. Olyphant, after a long term of service. His retirement was followed by numerous changes among the officers of the road, and a general overhauling of methods, the result resembling that which followed Mr. Truesdale's election as president of the Delaware, Lackawanna & Western.

The Anthracite Coal Strike Commission, appointed by President Roosevelt, in October, 1902, made its report in March. The commission virtually found that not one of the alleged grievances put forth by the United Mine Workers could be upheld by the evidence presented to the Commission, but, in spite of this, the Commission probably in order that its report might be unanimous, gave contract miners a 10 per cent increase, firemen an 8-hour day, and most other mine employees a nine instead of a 12-hour day. The findings of the board will be binding for three years, and any differences between operators and miners during that period are to be settled by a Board of Conciliation. A new sliding scale authorized by the Commission is based on an average selling price of $4.50 for prepaid sizes, f. o. b. New York Harbor.

The proprietor of several sensational newspapers, to promote his political ambition, brought suit against the anthracite railroads, alleging discriminations in rates, excessive freight charges, also combination to control prices, having succeeded in getting the Interstate Commerce Commission to take up the matter. The hearings in May, did not elicit evidence that would support the plaintiff's allegations, and the proceedings were cut short by a decision of Judge Lacombe to the effect that the Interstate Commerce Commission had no right to consider the class of evidence which the plaintiff's attorney wished to introduce. The Commission appealed from this decision to the United States Supreme Court.

The shipments from the mines for the past four years compare as follows:

	Tons, 1900.	Tons, 1901.	Tons, 1902.	Tons, 1903.
January	4,482,641	5,183,392	4,538,138	5,964,950
February	3,188,180	4,098,968	3,741,253	5,070,608
March	3,133,896	4,964,359	3,818,767	5,211,548
April	3,364,482	3,685,013	4,924,830	5,044,998
May	3,833,097	4,674,707	1,708,892	5,156,449
June	4,676,580	4,755,748	92,203	5,436,497
July	3,599,729	3,698,814	250,079	5,377,495
August	4,951,166	4,710,517	300,774	5,169,402
September	2,972,948	4,379,157	445,883	4,654,444
October	834,786	4,938,132	1,276,257	3,925,642
November	4,994,799	4,697,443	4,984,384	4,091,147
December	5,075,189	3,623,452	5,099,451	4,400,000
Totals	45,107,493	53,409,702	31,210,911	59,513,180

In 1903 each month from January to September inclusive established a new record of shipments, and the average for the nine months was nearly 5,232,000 tons monthly.

The f. o. b. New York harbor prices asked by the principal companies for free burning white ash coal were $4.75 for broken and $5 for egg stove and chestnut in January, February and March; $4.25 for broken, and $4.50 for egg, stove and chestnut in April; $4.35 and $4.60 in May; $4.45 and $4.70 in June; $4.55 and $4.80 in July; $4.65 and $4.90 in August, and $4.75 and $5 in September, October and November.

Trade by Months.—The year opened with coal in short supply everywhere and retail prices very high. The principal mining and transportation companies, however, refused to take advantage of the public need ,and sold their coal for the stated price of $5 f. o. b. New York harbor for egg, stove and chestnut sizes. Many independent operators, however, who sold to these companies under contracts that called for 65 per cent of the average tidewater selling price, objected to receiving 65 per cent of $5, claiming that the actual market price, was $10 or more. To avoid suits for damages, the companies voluntarily abrogated these contracts for three months, but sold the coal of the independent operators back to them at tidewater, leaving them free to get any prices they could.

Early in January these retail prices prevailed for stove coal: Minneapolis, $10; Chicago, $11; Boston, $16; New York, $13, and Philadelphia, $12. The territory that suffered most was New England, where the shortage of anthracite was the most acute ever known. Before February 1, owing to the extraordinary efforts of the principal coal mining companies, prices broke in the East, speculative coal f. o. b. New York harbor falling to $5.50 or less, and retail prices in the city to $7.50. A coincident decline in coastwise freight rates led to a heavy movement of coal to Long Island Sound ports, and to points beyond Cape Cod. In the West, however, receipts of coal by rail continued rather light, and prices showed little change. By March, as the result of the record-breaking shipments from the mines in January and February, retail prices had fallen to $8, and less at Boston for egg, stove and nut sizes, and $6.25 at New York. In the West, however, as all supplies received by lake were gone, and all rail receipts were very light, coal sold at Minneapolis as high as $20 at retail. By this time some independent operators were sorry that they had abrogated their contracts with the railroads, as the f. o. b. price at New York harbor had fallen to $5 per ton, and they were having trouble in collecting money from speculators who had bought at $10 and had to sell at a loss.

The Philadelphia & Reading announced in April that its basis prices for the ensuing year would be $4.75 for broken, and $5 a ton for egg, stove and nut sizes, f. o. b. New York harbor shipping ports, with graded monthly discounts. Other companies followed the Reading. The announcement of these prices led to a great rush of orders from eastern points, and also from the West, where docks were clean and supplies of anthracite completely exhausted. After the opening of navigation shipments up the Lakes became very heavy, and the movement showed no falling off until all dealers had their

yards well filled late in the summer. Retail prices, with the opening of navigation, fell to a parity with those at eastern points. During May, June and July wholesale trade in all anthracite territories continued very active with premiums paid at many points for prompt deliveries. Retail buying, though it fell off with the advent of warm weather, remained unusually brisk, since more people than ever before took advantage of trade discounts to lay in supplies early.

By the opening of August demand had lost much of its urgency, and premiums for prompt delivery were no longer paid. The small steam sizes felt the slackening in demand first for several reasons. For one thing many concerns had shipped all sorts of stuff as coal during the winter, some of it being no better than culm, but consumers had to use it from necessity. As bituminous prices declined in the spring, consumers who could, stopped buying the small sizes of anthracite. By September 1 consumers and dealers at nearly all points had about all the coal they wanted, and there was no prospect of improvement until the advent of cold weather, so the companies began to talk of restricting output. The market was then in such a state that a reduction of $1 a ton would probably have led to no great increase of orders. The first attempt at restriction was the closing of numerous washeries to prevent the accumulation of steam sizes at railroad storage points. Then the mining companies began to close breakers, which had been running steadily since the previous November and were in need of overhauling. During October many collieries were idle, though there was no concerted action at restricting output. Some companies closed some collieries and ran others full time; other companies tried to run all their collieries, except such as were idle for repairs, four days a week. The market for anthracite continued quiet until the cold weather set in late in November, even then demand improved but slowly, and though December was a coal-burning month, demand showed no great increase until the last week of the year, when several companies decided not to adopt a proposed plan of closing all their mines from before Christmas until after New Year. The year ended with every prospect of the market being on a distinctly weather basis until next spring.

Though many things are possible in the year of a presidential election, the outlook is that there will be no serious labor troubles at the mines or anything like a general strike, and that production, while less than in 1903, will be that of an ordinarily good year.

THE ATLANTIC SEABOARD BITUMINOUS TRADE.

During 1903 there was no change in the general policy of the chief railroads connecting the various producing districts with tide-water, these roads being the Pennsylvania and the Baltimore & Ohio, Chesapeake & Ohio and Norfolk & Western, all three virtually under the control of stockholders in the Pennsylvania company. The New York Central by its Beech creek line brings some coal to New York harbor, but is not an important factor in the seaboard trade. Producers during the year have complained of discrimination in car allotments, etc., but these complaints were not as general as during 1902. The railroads were better supplied with cars and locomotives, and owing to a falling market car-supply was generally sufficient for the needs of all producers during the last half of the year.

An important consolidation of the year was the bringing of the Consolidation Coal Company, with mines in the George creek district in Maryland, the Fairmount Coal Company with mines in the Fairmount region of West Virginia, and the Somerset Coal Company, owning a number of mines in Somerset county, Pa., under one control. This was done through stockholders in the Baltimore & Ohio railroad, which owns stock in the Consolidation Company. The combination was intended to prevent the Wabash system, which has been actively at war with the Pennsylvania, from getting tonnage from any mines controlled by the three companies named. The new combination was virtually a stock exchanging deal. The three allied companies have different managing officers, but sell through the same agents.

Another important consolidation was in Pennsylvania, where the lands of the Webster Coal & Coke Company and several small concerns were consolidated as the Pennsylvania Coal & Coke Company. This combination is the largest in the Clearfield region, controlling some 80,000 acres of land, chiefly in Cambria county, and is destined to be an important factor in the seaboard trade. It will ship over the Pennsylvania system and also next year by the New York Central.

The Wabash system has been making progress on its projected through line from the West to Baltimore by way of the West Virginia Central and the Western Maryland. Owing to the physical condition of the roads and the topography of the country the cost of putting the properties in shape will be great, and the time required will be several years. Grading has begun on the line from Cherry Run to Cumberland to connect the Western Maryland and the West Virginia Central. In West Virginia the former stockholders of the Davis Coal & Coke Company have organized the Davis Colliery Company, are building the Coal & Coke Railroad to connect with the West Virginia Central and the Chesapeake & Ohio, and are developing a large tract of coal land.

Trade by Months.—The year opened with demand very heavy, owing chiefly to the fuel shortage caused by the anthracite strike. Bituminous coal f. o. b. sold at Philadelphia for more than anthracite, or at $9 a ton, while many factories were closed waiting for cheaper fuel. Prices declined $1 per ton by January 10, when ordinary Clearfield sold at $7, f. o. b. New York harbor shipping port. This decline was due chiefly to large offerings of English coal, $4.50 and $5 per ton alongside at north Atlantic port. Contracts for domestic coal for the coming year were already being closed at prices 50c. or $1 per ton above the 1902 figures. The railroads had announced an advance of 10c. a ton in freight rates on April 1, and it was clear that miners would ask and get higher wages.

Then the railroads began to embargo cars to shippers who allowed coal to stand at tide-water, heavy imports began to arrive from England, and prices declined, though car supply at the mines was about 25 to 35 per cent of the demand. By February 1 prices had fallen to $5.25, f. o. b. New York harbor shipping port, though the tide-water receipts of domestic coal showed no increase, owing to slow transportation, short car supply, and to heavy seizures of coal in transit by the railroads. By February 15 speculative prices had fallen to $4 for Clearfield grades, and so much foreign coal was arriving at points beyond Cape Cod that there was little demand for domestic coal there. By February 20 the market was actually weak, and some of the lower grades of domestic coal were offered, f. o. b. New York harbor at $3, the decline being due to the heavy receipts from abroad, and to the unprecedented output of the steam sizes of anthracite. Car supply at the mine remained about 35 per cent of the demand.

With matters in this condition, producers, confronted by higher freight rates and higher mine wages, determined to get higher prices than market conditions warranted, and by correspondence and informal discussions decided that the mine price on new contracts for the best grades of Clearfield should be $2.25 per ton, with lower grades in proportion, making the average price of Clearfield about $2 and the New York harbor, f. o. b. price about $3.35. This was an advance of 50 per cent over the 1903 prices and was made against the advice of some of the best posted men in the trade, who felt that the advance would check buying and lead to price cutting. Some contracts for special coals had already been taken at prices ranging from $3.25 to $3.90. Consumers did not come forward at the prices asked, but bought from hand to mouth, taking the offerings of small concerns who had to sell. Car supply which had been ranging from 25 to 40 per cent of producers' wants by the end of March had increased to 50 per cent, while transportation from the mines to tide-water had been generally good for the first three months of the year, except for temporary interruptions by storms.

The opening of the new contract year in April found producers of the better grades of coal with their available tonnage for the year pretty well covered by contracts. Contracts already closed on Clearfield grades were at mine prices of $1.75@$2.10. The f. o. b. price, New York harbor, was $3, this, considering the advances in wages and freights, representing an actual advance to the producer of about 20c. per ton. The railroads enforced demurrage charges, and made charges on reconsignments at tide-water, and by the opening of May with transportation prompt and car supply at the mines 75 per cent of producers' needs, the ordinary grades of Clearfield sold at $2.75, f. o. b. New York harbor shipping port, while some coal, on which demurrage was accumulating, sold as low as $2.40. By May 15 the market was duller than for several years, and producers were beginning to talk of restricting output. By June 1 car supply had fallen to 50 per cent of producers' demand and the market improved, ordinary grades of Clearfield advancing to $3, f. o. b. New York harbor shipping port, by June 15. Prices slowly sagged off again, however.

During the last half of the year trade was quiet. The principal producers held meetings in the summer to re-affirm prices, but the heavy arrivals of foreign coal, the reduced demand because of many manufacturing plants being tied up by strikes, and the abundant water power for mills many using it, all prevented improvement. Ordinary grades of Clearfield, on July 15, sold at $2.50@$2.85, f. o. b. New York harbor shipping ports, and remained at about that level until into October, when producers of special grades who had found it impossible to maintain the contract prices named in February, voted to waive their schedules. This break in the higher grades affected the lower grades, and the market was temporarily demoralized, until efforts were made to fix minimum prices. Ordinary grades of Clearfield sold at about $2.40@$2.50 till into December, with better grades at $2.75@$2.85, f. o. b. New York harbor shipping ports. The year closed with these prices prevailing, f. o. b. New York harbor shipping port: George's creek, $3@$3.50; best grades of Clearfield, $2.60@$2.80; fair grades, $2.50@$2.60; good gas coal, $3.05@$3.15.

The outlook for the new year is encouraging, though it seems fairly certain that there will be labor troubles in certain fields which may check production for a while. The output for 1904 will probably not be as heavy as for 1903, but it is safe to say that producers' profits will average better than during the last half of the year just ended.

Coastwise Freight Rates.—The course of coastwise freight rates was influenced by the extraordinary demand for fuel at eastern points during the winter and by the demand for anthracite at spring prices. In January some cargoes from Philadelphia and New York to Boston got $2.50 rates and $1.50 to Sound points; but by January 20 rates had fallen to $1.25 to Long Island sound points and $1.90 to points beyond Cape Cod, from Philadelphia, and $1 to Long Island sound and $1.50 to Boston from New York harbor. They continued to fall, and on February 20 were 75c. from Philadelphia to Long Island sound points and $1.15@$1.30, according to size of vessel, to Boston, while from New York harbor quotations were 65@75c. to Long Island sound and $1@$1.25 to Boston, according to size of vessel. March 5 quotations from Philadelphia were 85c. to Providence, New Bedford and Long Island sound, and $1.05@$1.15 to Boston, Salem and Portland, and from New York harbor were 65@70c. to Providence, New Bedford and Long Island sound, and 85@90c. to Boston and Portland. Barge rates about New York harbor had fallen since January 1 from 35@40c. to 20c. By the end of April, owing to heavy shipments of anthracite, vessels were scarce

and rates were firm at these quotations: Philadelphia to Long Island sound ports, $1; Boston and Portland, $1.25; Portsmouth and Bath, $1.30; Bangor, $1.40; New York harbor to Long Island sound, 65@75c.; to points beyond Cape Cod, $1.15@$1.20.

By June 1, with less urgency for anthrâcite, vessels were in better supply, and these quotations prevailed: Philadelphia to Providence, New Bedford and Long Island sound, 75@80c.; Boston and Portland, 95c.@$1; Portsmouth and Bath, $1; Bangor, $1.25; from New York, 70@75c. to Sound ports, and $1@$1.15 to Boston and Portland. After this rates showed little change for several months. At the opening of September they were from Philadelphia, 70c. to Providence, New Bedford and Long Island sound; 85c. to Boston and Portland; 90c. to Portsmouth and Bath, and $1.10 to Bangor; from New York harbor, 65@70c. to Long Island sound points, and 75@80c. to Boston, Salem and Portland. At the opening of November rates from Philadelphia were 65c. to Providence, New Bedford and Long Island sound; 75c. to Boston and Portland; 80c. to Portsmouth and Bath, and $1 to Bangor, while from New York harbor quotations were 60c. to Long Island sound and 70c. to beyond Cape Cod. The year closed with these quotations prevailing: Philadelphia to Providence, New Bedford and Long Island sound, 60c.; Boston and Portland, 70c.; Portsmouth, 75c.; and from New York harbor to Long Island sound, 50c.; Boston and Portland, 60 @65c.

THE OIL INDUSTRY OF CALIFORNIA.

By C. T. DEANE.

Before reviewing the oil industry of California for 1903 it will be well to glance at the figures indicative of consumption. In 1900 the State consumed 4,000,000 bbl.; in 1901, 8,000,000 bbl.; in 1902, 13,692,514 bbl.; this year California will consume over 20,000,000 bbls.; while 30,000,000 bbl. will be a low estimate for 1904. All the railroads in the State are using oil-fuel in their locomotives, and machine shops; they are installing tankage as fast as possible, and by the middle of next year they will be using oil exclusively; the railroads alone will then use over 12,000,000 bbl. per year. Manufacturing establishments are using oil, thereby saving over 50 per cent in cost of fuel. All street railroads, both electric and cable, throughout the State, use oil only. The electric light and gas companies use large quantities. Most of the gas consumed in the State is now made from oil, and the price of gas has fallen one-third since oil has been substituted for coal. Of the lubricating oil used here, 75 per cent is made in local refineries; heretofore all was imported from the East. There are 40 refineries now in existence, an increase of seven since January of this year; these refineries make kerosene, distillate, lubricants, asphaltum, coke, etc. Since the beginning of the year the Standard Oil Company's great pipe line has been completed most successfully; it is transporting in the neighborhood of 10,000 bbl. per day, and all of this is being used at the large refinery. This pipe line is 278 miles long, and the pipe is 8 in. in diameter; there are pumping stations at intervals of 28 miles; the oil has to be heated to about 120° F., as in its natural condition it has the consistency of black molasses. It is assumed that the company is refining the oil for kerosene; the refinery also turns out large quantities of coke. There is no doubt that asphalt-base California crude oil can be refined into illuminating oil at a profit, and I believe that before another year the State will be producing all the illuminating oil needed on the Coast, and also exporting it to the Orient.

There are, in California, a large number of oil districts of varying importance, commencing at the extreme south of the State and running north, along the foothills, for 500 miles, or from south of Los Angeles to within a few miles of San Francisco, at Half Moon bay; there are strong indications and seepages still further north, in Colusa county, but as yet no commercial well has been developed there. There is one oil region in the State, that of Kern River, which is believed to have no equal in the world, if we except Baku, in Russia. In the Kern River district there are about 4,000 acres of absolutely proved land, with a depth of oil-sand averaging 400 ft. There are few wells that will not pump continuously, month in and month out, 100 bbl. per day, and a great many that are, and have been, producing for the past two years 250 bbl. per day. The other districts are some of them also great producers, notably Sunset, Coalinga, McKittrick, Fullerton and Santa Maria, about in the order named. A well in this State is not considered of commercial importance unless it pumps at least 50 bbl. a day, and a company must have several wells to make any money at present prices. In the Kern River district oil is selling at the wells at 20c. per barrel. If a company has 10 or 12 wells, producing 1,000 bbl. a day, or 30,000 bbl. per month, it can make lots of money at this price, as the cost of pumping should not be over 3c. a barrel. This is the reason that oil is not selling at a higher price.

There are in California four buyers of oil—the Standard Oil Company, which owns no wells; the Associated Oil Company, owning probably half the wells in the Kern River district and two-thirds of the wells in McKittrick; the Southern Pacific Railroad, and the Union Oil Company. These last three own wells themselves, but also buy some oil from independent producers; however, the Standard sets the price, and as it has large contracts running for three years yet, it is very independent; if a combination of outside interests could be brought about, oil might quickly appreciate in value; but, as I said, as long as companies with ten or more wells can make money at present prices, they will sell their oil, and unless consumption increases faster than production, this state of affairs will continue. There are probably enough wells now drilled to produce 30,000,000 bbl. in 1904, and if all work on new wells should cease, oil would rapidly increase in value; but there is no hope of that, and the owners, by being in too great hurry to develop their property, will keep the price at about the present figures for some time to come.

The cost of developing an oil property in California depends very largely on the district in which it is situated; in the Kern River, Sunset, McKittrick or Coalinga districts, wells can be drilled 1,000 ft. deep for about $3,000 each, or 10 wells can be put on the pump, including all outlays, for $50,000; the cost of the land, of course, will vary in each district, or a favorite way now is to lease land on a royalty; this also varies according to location.

The increased production of petroleum is probably the greatest single factor in the prosperity of the Pacific Coast for the past few years. It not only kept a large amount of money here, that would otherwise have gone to foreign countries for coal, but it has enabled local manufacturers here to compete with those of the Atlantic seaboard; I estimate that over $20,000,000 has been kept in San Francisco which would have been paid for coal; this money has gone into real estate, to develop oil properties, and into new manufacturing plants.

It might be well here to give a comparison of the steam energy as between coal and oil. Sixteen tons of oil (or 104 bbl.) give the same horse-power as 25 tons of the best steam coal. The evaporation per pound of coal at 212° is 9.17 lb. The evaporation per pound of oil at 212° is 15.1 lb.; thus 1,362 lb. of oil (or about 4 bbl.) seem equivalent to 2,040 lb. of coal, which gives a ratio of efficiency of oil to coal of 1.65 to 1. One barrel of oil equals about 300 lb.; a barrel contains 42 gal. One of our ferryboats uses 143 bbl. of oil in 48 hours; formerly the same boat used 40 tons of coal to do the same work; this equals 3½ bbl. to a ton of coal; or, in money, this fact may be expressed thus:

Forty tons coal at $6	$240.00
One hundred and forty-three barrels of oil at 70c	100.10
Estimated saving	$139.90, or over 58 per cent

A very important future use for fuel-oil is in marine boilers. There are at present nearly 200 vessels, large and small, using oil in and out of this port. Ferryboats, bay and river steamers, with hardly an exception, use oil. There are at least 25 ocean steamers plying between the Hawaiian Islands, and also the mail steamers between San Francisco and Tahiti, which carry sufficient fuel for the round trip. There is fitting up now, at the Risdon Iron Works, a large freighter which runs between San Francisco and New York by the straits of Magellan; she will carry sufficient oil for her entire trip, without stopping en route. The cost of fuel for the round trip between San Francisco and the Orient can be cut in half by the substitution of oil for coal; the difference in cost to the government, if the transports between here and Manilla used oil instead of coal, would be $20,000 for the round trip. It is only a question of time when every vessel out of the ports of California will be compelled to use the new fuel.

As far as the question of safety is concerned, the best answer is, that for the past four years all our ferries and a number of our deep-sea vessels have carried millions of passengers without a single accident due to the use of oil-fuel. The permanence of the supply need not trouble this generation; the single district of Baku, in Russia, has been producing for 10 years about 60,000,000 bbl. per year from 2,400 acres of oil-land. It is estimated that in the single district of Kern River there are 4,000 acres of absolutely proved land, with live oil-sand averaging 400 ft., or considerably over 1,000,000,000 bbl. of oil.

BROMINE.

By JOSEPH STRUTHERS.

The production of bromine in the United States during 1902, including the quantity of bromine contained in potassium bromide, amounted to 603,500 lb., valued at $172,000, as compared with 513,890 lb., valued at $128,472, in 1902, thus showing an increase in quantity of 89,610 lb., and in value of $44.528 for the year just closed. The greater bulk of the product is obtained from Michigan, the balance being supplied from the salt-wells in West Virginia, Ohio and Pennsylvania.

The price of bromine during 1903 has been very erratic, beginning the year at 25c. per pound, and going to as high as 40c. for a few lots in July and August; toward the end of the year it has been quoted at 30c. The average for the entire year may be taken at 28.5c. per pound.

The world's production of bromine continues to be controlled by the associated American producers and by the Leopoldshall-Stassfurt Convention, the latter association continuing operative for several years to come. There has been very little, if any, change in the bromine industry in the United States during 1903. More than one-half of the total output was furnished by Michigan, which contributed approximately 270,000 lb. in the form of potassium bromide and 56,500 lb. in the form of liquid bromine (total 326,500 lb.), as compared with the respective quantities of 165,000 to 61,452 lb. (total 226,462 lbs.) for the year 1902. The chief producer in Michigan is the Dow Chemical Company at Midland. The processes of extracting bromine from the Michigan limes are summarized in 'The Mineral Industry,' Vol. XI. An interesting note in relation to the development of the bromine industry is the establishment of salt blocks near St. Charles, southwest of Saginaw, to obtain salt from the Marshall brine by utilizing waste coal. According to Prof. Alfred C. Lane, the wells have been sunk to a depth of 832 ft. and cased 540 ft. Bromine is reported to be extracted from the bittern of the salt to an extent of 100 lb. daily. The Dow Chemical Company has started a new plant at Mt. Pleasant, and has sunk 4 wells which reach the Marshall sandstone brine at a depth of from 1,405 to 1,565 ft.

Phenocrysis is from the Greek—*phaino*, show, and *krystallos*, crystal. The latter comes from *kryos*, frost.

SULPHUR.

By JOSEPH STRUTHERS.

The production of sulphur in the United States during 1903 is estimated at 13,500 short tons, valued at $262,175, as compared with 8,336 short tons, valued at $220,560 in 1902. The greater part of the output was obtained from the mines of the Union Sulphur Company, near Lake Charles, Calcasieu parish, La., the balance coming from the mines of the Utah Sulphur Company in Beaver county, Utah, and those of the Nevada Sulphur Company at Rabbit Hole Springs, near Humboldt, Humboldt county, Nev. Although the production of domestic sulphur in the United States has never exceeded 1 per cent of the total consumption, it is a promising feature to note that the output from the domestic mines during 1903 is the largest ever recorded, which indicates that the development of this branch of the mineral industry is of good promise.

During 1903 the total consumption in the United States of sulphur from domestic and foreign sources, together with the sulphur content of pyrite used for the manufacture of sulphuric acid (including both domestic and foreign product) aggregated 472,662 long tons as compared with 481,830 tons for 1902. The details of the supply are given in the subjoined table, the imports for December being estimated:

	1902. Long tons.	1903. Long tons.	Changes.
Sulphur, domestic	7,443	12,054	I. 4,611
Sulphur, foreign (net imports)	174,939	185,796	I. 10,857
Sulphur content of domestic pyrite	102,689	88,636	D. 14,053
Sulphur content of foreign pyrite	196,759	186,176	D. 10,583
Total consumption	481,830	472,662	D. 9,168

The average monthly prices of sulphur and details of importation are given in the review of the chemical markets later in this paper.

THE AMERICAN CHEMICAL AND ALLIED MINERAL TRADES IN 1903.

By CHARLES C. SCHNATTERBECK.

Summed up, the year's trading shows a fair average net profit, considering the labor troubles, high cost of raw materials and the keen competition in the heavy chemicals. The United States is gradually becoming independent of foreign sources of supply, and by optioning sulphur and potash mines in other countries has laid the foundation for future competition in manufactures with Great Britain and Germany. With improved methods, cheap power, and skilled labor, America should enlarge its export trade; and in fact, is already sending quantities of caustic soda, bicarbonate of soda and other so-called British products to Europe and the far East.

American combinations have had an eventful year. The salt and asphalt consolidations went into liquidation, while the Southern fertilizer combination, known as the Virginia-Carolina Chemical Company, has expanded so rapidly as to necessitate a bond issue and an additional heavy loan from New York bankers. Subsequently the company suspended its common stock dividend of 1.25 per cent quarterly after having paid $3,678,829 on this issue, and will pay only the 8 per cent annual dividend on the preferred, which to date has yielded $7,020,869, besides meeting the interest on the $7,000,000 5 per cent sinking fund bonds. The General Chemical Company, called the Eastern heavy chemical trust, though it does not control all the works, has increased its common stock dividend to 5 per cent per annum, and pays 6 per cent on the preferred. The National Lead Company, the most powerful combination in the mineral paint industry, has made its charter perpetual and enlarged its manufactures. The latest industrial aggregation is the blasting powder and dynamite monopoly, headed by the E. I. Du Pont-De Nemours & Co., of New York, who have increased their capitalization to $50,000,000 for this purpose. This consolidation is virtually a public announcement of the agreement that has existed among the manufacturers in this country for some time past, and is said to control about 95 per cent of the business in this country.

Cyanide.—Aside from a good domestic demand, a fair export trade was done with Mexico, South America and Canada, at rather low prices. With a domestic production of about 2,500,000 lb. the United States imports annually between 3,000,000 and 4,000,000 lb. from Great Britain and Germany. Market prices have felt the anxiety of foreign makers to unload heavy stocks, accumulated in recent years. Importers at New York quoted 19.5@21c. per lb., and probably took some large contracts at less, although there is a duty of 12.5 per cent ad valorem on potassium cyanide and 25 per cent. on sodium cyanide.

Bleaching Powder.—Consumption has been large notwithstanding labor troubles in certain important industries, but prices were affected by keen competition until in October, manufacturers buried the hatchet and agreed to maintain prices. The imports of foreign bleach into the United States in 1903, paying a duty of 0.02 cents per pound, amounted to 109,003,234 lb., of which Great Britain furnished 88,744,166 lb., or 81.4 per cent. Compared with 1902 the total imports show a decrease of 3,371,244 lb., or 3 per cent. Re-exports were 779,826 lb., as against 198,794 lb. in 1902, the difference indicating that the domestic production and quality of bleach is improving, particularly in the central West. Foreign prime bleach sold in New York in the early months of the year at $1.75 per 100 lb., but in September free offerings of varied test brands were made as low as 85c. The extreme monthly average prices were $1.42 in February, and $1.01 in October, making $1.187 for the year. Domestic prime bleach touched $1.25 f. o. b. works in February, and 75c. for off-test in May and later; the year's average was $1.017. Contracts for 1904 delivery at seaboard have been taken at $1.25 per 100 lb. for prime British and American, and $1.20 for Continental brands. Lower grades have been booked at a discount.

Copper Sulphate.—There were imports of British blue vitriol in the face of a 0.5c. per lb. duty, a loss of 62.8 per cent to 8,355 long tons in domestic exports, and a further reduction of 20.5 per cent to 17,309 tons in production, owing partly to the disastrous fire at the works of the Nichols Chemical Company. Better prices obtained in 1903, as a result of a higher market for copper and of the centralization of the trade. The best prices were reported in February-May, $5.875 per 100 lb. being touched in April; the lowest was $4.125 in January. The extreme monthly average prices were $4.37 in January, and $5.54 in March, making $4.87 for the year. Frequently the British article sold below the domestic, but on the whole both brands maintained a satisfactory level.

Arsenic.—This country is the largest consumer in the world, importing annually fully 6,000,000 lb. white arsenic, metallic arsenic, and arsenic sulphides from Europe and Canada, and the attempt to increase the American production, has suggested an international trade agreement. Recently importers booked contracts for white arsenic at an average of 2.975 cents per lb., for French; 3.125c. for Spanish and German, and 3.25c. for British, f. o. b. New York. In January there were sales as low as 2.75 to 3.125c., according to brand, and summed up the year's prices have been less than 1902, owing to competition. Red arsenic, imported from Germany, was also weak, receding from 6.75@7c. per lb. in January to 6.375@6.50c. later.

Sulphuric Acid.—The heavy consumption, especially by the fertilizer and petroleum industries, with the friendly relations among the larger eastern acid-makers, has resulted in satisfactory market prices. Contract deliveries in 1903 and 1904 in New York and vicinity have been quoted on the basis of $1.05 per 100 lb. for 60° acid in carboys, and $18@$20 per ton in bulk; $1.20 per 100 lb. for 66° in carboys, and $21@$23 per ton in bulk, and $13.50@$14.50 per ton for bulk chamber or 50° acid. In other parts of the country, especially in the central West where acid is made chiefly as a by-product in treating zinc sulphide ores, lower prices have been received, but the eastern market is practically free from this competition.

Nitric Acid.—The continued strength in the raw material market is reflected in the prices for nitric acid, for this or next year, which are $4.37½ per 100 lb. for 36° in carboys, delivered in New York and vicinity; $4.75 for 38°; $5 for 40°, and $5.37½ for 42°. Consumption is good.

Oxalic Acid.—Only occasionally was the market unsettled by a pressure to sell on the part of importers, and during the flurry quotations at New York dropped to $5@$5.12½ per 100 lb. At other times the market was firm at $5.25@$5.50. Contracts for 1904 delivery were booked in October and later at $5 for German and British, and $5.25@$5.50 for Norwegian. The annual imports into the United States are something between 5,678,000 and 5,700,000 pounds.

Muriatic Acid.—Buying by consumers has been about up to the average in the past year, and prices have been remunerative to the producer. The average quotations at New York for 1903 and 1904 deliveries are $1.50 per 100 lb. for 18° acid, $1.60 for 20°, and $1.75 for 22°.

Brimstone and Pyrites.—The United States is the leading consumer of sulphuric acid. Nearly 60 per cent of the consumption of sulphur is met by pyrites, primarily because the cost is less than crude brimstone; 79 per cent of all the sulphur used in this country during the year was imported—as brimstone from Sicily and Japan, and as iron and copper pyrites from Spain and Canada. Analyzed the demand is met as follows; the figures being in long tons:

	Brimstone. 1902.	Brimstone. 1903.	Pyrites. 1902.	Pyrites. 1903.
Production	7,443	12,054	228,198	196,970
Imports	174,912	185,025	440,363	420,491
Total	182,355	197,079	668,561	617,461
Exports	1,253	962	3,060	1,330
Consumption	181,102	196,117	665,501	616,131
Sulphur content	177,480	192,195	292,629	283,673

The total consumption in 1903 shows a decrease of 5,759 tons, which is rather small considering the heavy falling off in the production and imports of pyrites. In addition to the above there has been an increased consumption of sulphur recovered from zinc-blende and other sulphide ores in the central West.

Brimstone has ruled high, and until the deposits in Mexico and Alaska, optioned to Americans, are developed actively the Anglo-Sicilian Sulphur Company which controls 85 per cent of the output in Sicily, will continue to dictate prices. New York importers booked shipping contracts for Sicilian brimstone at an average of $22.75 per ton in January and $21.75 in June, or $22.25 for the year for best unmixed seconds, which is only 75c. more than the average price in Sicily, plus the freight of $1.84 per ton. Best thirds sold in New York in January at an average of $20.75, and in November at $21.50, making $21.20 for the year, which is only 40c. more than the Sicilian delivery price at Atlantic ports. Of course, re-sales have been made on spot at higher prices, but taken as a whole the margin of profit for importers has been rather small.

A 7 per cent decrease in the demand for pyrites this year has naturally affected prices somewhat, but as sellers usually make long-time contracts with consumers the transient market is seldom disturbed. Ocean freight rates from Spain, averaging from 9s. 6d.@12s. 6d. ($2.28@$3) per ton also had some influence on the market, while the heavier imports of Pilley's Island pyrites attracted no little attention. Spanish pyrites, containing from 43@51 per cent sulphur, sold at 10@13.5 cents per unit for lump, and 9@11.5 cents for fines. Domestic ore, carrying from 42@44 per cent sulphur, brought an average of $5 per ton for lump, and 10c. per unit for fines, f. o. b. Atlantic coast mines.

Nitrate of Soda.—An increased consumption, higher market prices, comparatively lower ocean freight rates from South American ports, and the adjustment of the *quotas* of exports from Chile for the third year (April 1, 1903, to March 31, 1904), at 32,500,000 qtls. give hope for continued prosperity. Earnings of the *oficinas* are large and it is also noteworthy that on the year's exports of 1,405,143 long tons the Chilean government has collected about $17,-

823,640, besides enriching its treasury from the sales of mineral-bearing land in Tarapaca and Toco.

Chile is still the great source of supply of nitrate of soda, but there is reason to believe the developments in the Death Valley region of California will attract attention before the expiration of the Chilean combination in 1905.

An idea of the magnitude of the Chilean industry is given by the table below covering the calendar years 1902 and 1903; the figures are in long tons:

	1902.	1903.	Changes.
Production	1,352,989	1,449,116	I. 96,127
Exports	1,364,345	1,434,849	I. 70,504
World 'sconsumption	1,288,181	1,446,724	I. 158,543
Visible supply December 31.	996,326	953,359	D. 42,967

Noteworthy features in 1903 have been an increase of 11.9 per cent in consumption, and a decrease of 4.3 per cent in the visible supply (stocks and afloat) at the end of the year.

The consumption by powder manufacturers, agriculturists and others in the United States in 1903 was the largest on record, amounting to 256,673 long tons. European consumers, principally the beet sugar industry, are credited with 1,160,752 tons. The balance of the consumption has been distributed among various countries in Central and South America and elsewhere.

More expensive labor has increased the cost of production in Chile, which justified higher prices for nitrate. In 1903 sales alongside vessel in Chile were made at 6s. 3d. to 7s. 2d. per qtl. ($33@$37.84 per long ton) for 95 per cent quality, and at 6s. 6d. to 7s. 3d. per qtl. ($34.36@$38.28 per ton) for refined. Ocean freight rates to consuming markets were demoralized, being 12s. 6d. ($3) per ton at long intervals, but in June, when the California cereal markets were active, the rate advanced to 21s. 3d ($5.10), weakening again later to 13s. 6d. ($3.18). The export tax imposed by the Chilean government remains at 2s. 4d. per qtl. ($12.32 per ton).

Prices in the United States were best in the latter part of the year, when delayed arrivals and the destruction in December of the *Lady Joicey*, carrying 4,500 tons, affected the visible supply in the face of an urgent demand. Most of the business done was in futures, sales on spot being comparatively small and usually by second-hands. Importers at New York booked future orders at $1.85@$1.975 per 100 lb. in January, while spot sold at $1.975@$2.05. In February the averages were $1.91 for futures and $1.99 for spot; March, $1.93 and $2.18 respectively; April, $1.89 and $2.05; May, $1.98 and $2.05; June, $2 and $2.11; July, $1.99 and $2.03; August, $2.04 and $2.16; September, $2.06 and $2.17; October, $2.03 and $2.16; November, $2.04 and $2.12; December, $2.04 and $2.22; year, $1.98 for futures, and $2.20 for spot.

Sulphate of Ammonia.—Production and consumption have increased in proportion to the freer use of sulphate of ammonia mixed with superphosphate in the manufacture of artificial fertilizers. Imported gas liquor, 24@25 per cent, sold in New York at $3.025 up to $3.30 per 100 lb. for forward shipment while domestic brought $3 to $3.15. Spot sales were made principally in small lots at usually 5 cents more or less, as speculators were influenced by the rulings in the primary markets.

Saltpeter.—The consumption in 1903 has been the largest in years, imports into the United States amounting to 13,552,059 lb. Crude saltpeter sold in New York at $3.30 to $3.75 per 100 lb. for immediate delivery, and at $3.25 to $3.60 for future shipment. The refined quality brought $4 to$4.50 per 100 pounds.

Zinc Oxide and White Lead.—Labor troubles in the building trades interfered somewhat with the domestic market and reacted on the production of white lead. A larger export trade encouraged the output of zinc white. American dry white lead sold in New York at 4.50 to 5.75c. per lb., according to quality and time of delivery, while extra dry zinc oxide brought 4.375 to 4.75c. Foreign brands sold proportionately higher than the domestic, owing to the duty of 2.875c. per lb. on white lead, and 1c. per lb. on dry zinc white, and 1.75c. in oil.

Phosphates.—The most interesting feature in the past year has been the centralizing of control by purchase of some of the more important hard rock and land pebble mines in Florida by the Dutton Phosphate Company and Mr. James Hull. Incidentally these parties have secured a large share in the export trade, the main support of the Florida industry, 80 per cent of the production was exported in 1903. Prices have improved and there has been a gradual elimination of speculative buying. New discoveries of phosphate-bearing ground are few, and the belief is growing that the high-grade rock-area is becoming exhausted.

The production of all classes of phosphates in the United States in 1903, estimated below at 1,477,601 long tons, is somewhat less than the previous year, owing to a curtailed demand, as indicated by the shipments given.

	Production.	Shipments. Domestic.	Shipments. Foreign.
Florida hard rock	438,750	1,000	466,819
Land pebble	285,188	149,008	153,563
Peace river	49,985	49,985	.....
Total, Florida	773,923	199,993	620,382
Tennessee	422,889	313,008	117,387
South Carolina	280,789	218,227	40,929
Total, United States	1,477,601	731,228	778,698
Total, 1902	1,487,471	782,455	821,515

It is worthy of comment that although 52.8 per cent of the production was sent abroad, the proportion is less than 1902. Our best customers were Germany and Belgium for hard rock, and Italy, France and Great Britain for land pebble.

The prices obtained in 1903, based on monthly averages, were as follows, per ton:

	F. O. B. High.	F. O. B. Low.	F. O. B. Year.	C. I. F., Europe. High.	C. I. F., Europe. Low.	C. I. F., Europe. Year.
*Fla. hard rock, 78@80%.	$7.25	$6.25	$6.95	$11.70	$9.78	$10.86
*Fla. land pebble, 68@73%	3.69	3.13	3.49	7.88	6.83	7.64
†Tenn. exp. rock, 78@82%	4.13	3.38	3.93	10.80	8.97	10.35
†Tenn. domes. rock, 78%.	3.88	3.00	3.62	....	....	....
†Tenn., 75%.	3.50	2.88	3.30	....	....	....
†Tenn., 73@74%	3.08	2.35	2.85	....	....	....
†Tenn., 70@72%	2.83	2.18	2.61	....	....	....
‡So. Carolina land rock..	3.25	3.25	3.25	6.08	5.83	6.00
‡So. Carolina river rock..	2.88	2.88	2.88			

*F. o. b. Florida or Georgia shipping ports. †Mount Pleasant, Tenn. ‡On vessel, Ashley river, S. C.

Ocean freight rates from Southern ports showed little variation from last year, and were: To Continental ports, 10s. 3d.@15s. 6d. ($2.46@$3.72); Baltic, 13s.@16s. ($3.12@$3.84); United Kingdom, 12s. 6d.@13s. 6d. ($3@$3.24); Mediterranean, 14s. @15s. 6d. ($3.36@$3.72). There was also a charter from Tampa, Fla., to Japan at 20s. ($4.80), the cargo being 2,700 tons land pebble.

A surprising feature is the continued large imports of phosphates from Belgium and other countries, which in 1903 amounted to about 136,531 tons and were used principally at "fillers" for artificial fertilizers.

THE STOCK MARKETS IN 1903.

As had been expected, the year 1903 showed a marked reaction in the speculation in industrial securities; prices generally have made low records, and liquidation, notably in the iron and steel section, has been very heavy. A change in the fiscal policy of some of the larger combinations, such as reducing or passing their regular quarterly dividends as a result of adverse trade conditions and labor troubles, partly explains the unfavorable situation in the stock market. Contrary to custom, however, trading in mining shares has not been influenced much by the bear raids in the industrials, although there was intermittent wavering on account of tight money consequent upon the wild speculation in the industrials. A favorable feature in the mines list, which partly offset the western labor troubles, was the improvement in market prices for the commercial metals. Larger dividends by many mines also gave encouragement to investors, and at the end of the year the opinion prevails that 1904 will show a healthier condition in the stock market.

THE NEW YORK MINING STOCK MARKET IN 1903.

By CHARLES C. SCHNATTERBECK.

The year has been one of low record prices for many securities. There were occasional recoveries from the general downward trend of the market, but tight money, labor troubles, the interminable copper litigation in Montana and the showing made by the investigation of certain industrial fiascoes combined to prevent any general advances in values. Some encouragement, however, may be had from the higher prices for copper, silver and lead, which have made it possible for certain low-grade mines to pay dividends, and the year closed with signs of an improvement.

Prices of the copper shares fluctuated violently. The leader has been Amalgamated, and its variegated career on 'change and off has made many an investor feel uncomfortable. Not only has the company failed to raise the 2 per cent annual dividend to the original 8 per cent basis, but adverse litigation in Montana resulted in closing the mines in October for about a month. The consequence was that the shares dropped from $75.625 in March to $33.625 in October, a reduction in the market value of the property of over $65,000,000. In November and December the shares showed some recovery, perhaps because a prominent Boston operator tried to work the market by advertisements in the daily press and by systematically circularizing the Amalgamated shareholders.

Anaconda, an asset of Amalgamated, paying a dollar dividend, the same as last year, was seldom attractive to speculators, and fell from $31.375 in March to $14.50 in October, practically a discount of $20,250,000, or about 54 per cent of its capitalization in eight months. It is interesting to note that $14.50 is the lowest price on record, and compares with $70 quoted soon after the incorporation of the Amalgamated Copper Co., in April, 1899, while the dividend has been cut to one-quarter what it was in 1900.

United, Amalgamated's rival in Montana, has not suffered much from speculation, as the preferred shares, paying 6 per cent dividends annually, are held largely by insiders, although there was an auction sale in August of 100 shares at $60, par $100. The common, however, has frequently appeared on curb, selling at $31.50 in January, but in March, when there was uncertainty as regards the renewal of the underwriting syndicate that floated the company, the stock dropped to $10. With later assurances that the syndicate would be extended, those participating to receive a cash dividend of 7 per cent, the stock advanced to $19.25 in July, only to fall to $10 in November. In December the quotation rose in sympathy with the other coppers.

Tennessee has gained favor, being ably managed and having paid its first semi-annual dividend on July 1, 1903, at the rate of 10 per cent per annum. From $15.75 in January the stock rose to $32 in July, when the company's finances showed an appreciable increase, and to $32.50 in October. Later, however, there was a reaction.

Greene Consolidated, of Mexico, has had an eventful time on curb, and the officers have been busy contradicting rumors. Three dividends of 2 per cent each were paid in January, February and May, periods in which speculators were active, and the price of the shares kept below par, $25. The settlement of the Marcus Stine stock suit in January, and the announcement in August that certain men identified with the Amalgamated Copper Co. had become large holders as a result of a loan made to the company, had an important bearing on stock prices. The high mark was $27.25, in March, and the low, $19,875, in November. In December, prices showed some recovery.

White Knob, of Idaho, caused some speculative buying when it increased its share capital by 50,000, reduced its par value to $10, and authorized a 6 per cent bond issue of $500,000, convertible into stock at the ratio of 80 shares for each $1,000 debenture. These bonds were for a time bought by arbitrage houses, owing to the difference between the value of the bonds and the stock, but before long the stock was sold at its parity with the bonds. The highest price of the year was $19.625, in May, the lowest $8.24, in September. A revival set in about October

20 when the company's smelter shipped its first copper, and the stock touched $11. In November, however, quotation fell to $8.75.

British Columbia has been very quiet, there being no sales for weeks at a time. In January, when a second increase in capitalization was proposed, the shares sold at $5.75 to $4; and later in the month, when the $150,000 advanced to the Montreal & Boston Co. was liquidated by 30,000 shares of treasury stock, British Columbia shares rose to $8.75. On February 10 the capitalization was increased by 250,000 shares, par $5, ostensibly to pay for improvements at the company's smelter and for purchasing additional property. About this time sales were made at $7.875, but in March the coal miners' strike interfered with work at the smelter, and quotations broke to $4.50.

Of the gold and silver shares, Homestake, of South Dakota, declared only a 3 per cent dividend on its capital stock this year, considerably less than 1902. This is partly explained by the extensive improvements made. The high price was $69.75 in March, and the low, an auction sale of 180 shares in May at $50, or half par value.

Ontario Silver, of Utah, has passed the usual dividend this year, notwithstanding higher metal prices. The company is improving the property and building a large concentration mill. The stock fell from $7 in March to $4.50 in September, but in December recovered to $6. Horn Silver, of Utah, paid one dividend in the last two years. The price fell from $1.50 in February to $1 in March. Later the stock rose to $1.30, but in November weakened to $1.05, with trading uninteresting. Daly, another Utah stock, has attracted some attention. The shares fell from $5 in February to $1.60 in September, partly because of the burning of the old hoisting works.

Standard Consolidated Gold, of California, that pays now 4 per cent annually, and has returned more than twice its capitalization, weakened with the general market from $3.50 in March to $2 in September. Brunswick Consolidated continues to levy quarterly assessments of 3 cents each.

The Cripple Creek gold stocks have naturally felt the strike that closed mines and mills. Portland, paying quarterly dividends at the rate of 36 per cent per annum on $1 par, was not only hurt by the millmen's strike, but had some trouble with its mill. The stock dropped from $1.85 in January to 95c. in November. Vindicator Consolidated cut its quarterly dividend of 5 per cent to 3 per cent in October, and the stock weakened from 95c. in May to 75c. in August. Isabella, to settle the damage suits brought by the Orphan Bell and Empire State companies, reorganized as Isabella Mines Company, with a $3,000,000 capitalization. Of this the old Isabella stockholders received $1,125,000, or 37.5 per cent, at the ratio of one new share for two held. The old Isabella company, capitalized at $2,250,000, paid in dividends $742,500, or 33 per cent. Its stock sold down from 30c. in January to 7.5c. in December.

Comparatively little has been done in the Leadville stocks, although Iron Silver, upon payment of four 10c. dividends this year, advanced from 77c. in January to $1.90 in October. The Comstocks had a brief rally in January and early February, with the report of the Best & Belcher ore find, but fell with the next levy of assessments. Best & Belcher dropped from $4.35 in January to $1.30 in October, Ophir from $3.20 to $1, Consolidated California & Virginia from $3.10 to $1.10.

Quicksilver, of California, sold from $8 down to $5.25 in nine months, notwithstanding that earnings at times were fully three times the 0.5 per cent dividend paid for the year. The common shares split their price in half, from $3 to $1.50 in three months.

The various industrial combinations have suffered from forced liquidation, owing directly to the disinclination of the banks to accept the shares as collateral, but primarily to over-speculation. United States Steel reduced the dividend rate on the common stock from 4 to 2 per cent, and in the last quarter passed it. The preferred was $89.75 on January 7, and $49.75 on November 10; the common $39.875 on February 5, and $10 late in the year. The slump in the market value of the Corporation's property in 11 months was $635,687,500, or four times the amount paid in dividends to date. No wonder stockholders look sad.

American Smelting & Refining, the smelter trust, continues to pay 7 per cent on the preferred stock, but these shares fell below par, and on October 15 touched $80.25, recovering in December. The common stock will receive a 1.25 per cent quarterly dividend in January, 1904. Sales of common were made at $52.875 in February down to $36.75 in October, but on December 15, when the dividend was declared, prices rose to $50.125.

The United States Reduction and Refining Company, the Colorado mill combination, felt the labor troubles severely, being compelled in October to pass the 1.5 per cent quarterly preferred dividend, and in December, the one per cent on common.

FLUCTUATIONS IN INDUSTRIAL STOCKS IN 1903.

Name of Company	Par Value.	January. H.	January. L.	February. H.	February. L.	March. H.	March. L.	April. H.	April. L.	May. H.	May. L.	June. H.	June. L.	July. H.	July. L.	August. H.	August. L.	September. H.	September. L.	October. H.	October. L.	November. H.	November. L.	December. H.	December. L.	Sales. Shares.
†Allis-Chalmers	$100	20.00	18.13	23.00	18.00	24.50	19.00	19.50	16.00	17.00	14.75	14.25	12.00	13.00	11.88	...	...	11.38	10.38	9.00	8.00	8.00	...	7.00	...	16,507
†Allis-Chalmers pf.	100	86.13	64.63	87.50	70.13	88.00	81.00	87.00	86.00	84.00	83.00	80.00	...	82.00	81.50	80.00	...	...	...	60.50	60.25	...	...	...	...	2,400
†Am. Agrl. Chem.	100	25.00	19.25	26.00	22.00	25.25	21.75	26.00	22.00	20.00	...	17.50	...	...	...	15.00	7.00	38.50	12.00	...	...	14.50	13.00	...	...	13,160
†Am. Agrl. Ch. pf.	100	90.00	76.00	83.50	82.00	88.00	79.00	80.00	78.00	80.00	...	74.50	...	...	...	...	...	77.50	69.00	...	...	72.50	69.50	...	...	3,617
†Am. Cement	10	9.00	8.25	8.50	8.00	8.13	7.75	8.00	7.75	8.00	7.88	8.00	7.80	9.88	6.75	7.75	7.00	6.88	6.25	7.00	6.38	7.75	6.38	24,566
†Am. Sm. & Ref.	100	47.50	42.75	52.88	46.00	51.38	47.63	51.88	46.75	51.00	47.50	48.00	43.00	46.00	43.00	46.25	39.13	40.50	36.75	44.25	42.88	51.00	44.00	86.00	86.00	986,981
†Am. Sm. & Ref. pf.	100	98.13	92.88	99.50	95.63	98.50	94.00	95.63	91.75	120.50	91.50	120.75	91.00	94.13	86.50	94.13	86.50	95.63	86.75	88.50	81.00	86.00	83.00	47.25	46.00	217,196
‡Cambria Iron	50	49.00	45.00	49.00	48.50	48.88	47.50	48.00	46.00	48.00	47.00	47.00	46.50	47.00	46.25	42.75	39.00	47.00	45.50	46.00	43.00	47.25	46.00	19.13	17.50	4,763
†Cambria Steel	50	28.75	24.88	25.50	24.50	25.13	23.38	25.00	23.50	24.75	22.13	23.75	22.00	24.00	22.00	22.50	20.00	22.50	17.13	20.00	18.00	18.75	17.25	24.50	24.00	194,954
†Col. Fuel & Iron	100	82.50	73.00	76.50	73.00	107.00	63.00	66.13	54.00	70.88	61.25	69.75	59.00	80.13	40.00	40.13	51.38	41.00	25.00	32.75	24.00	33.00	24.50	439,892
†Col. & Hock. C. & I.	100	20.75	19.00	22.13	19.00	20.88	19.00	20.50	19.00	20.25	16.00	18.00	15.00	17.75	13.50	15.88	11.00	15.13	11.00	12.00	10.00	10.88	8.75	15.25	11.00	74,684
†General Chemical	100	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	54.00	51.00	670
†Gen. Chem. pf.	100	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	96.50	...	...	...	100
‡Lehigh Coal & Nav.	50	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	64.00	65.38	66.00	60.00	2,477
*Mong. Riv. C. & C.	100	12.50	10.13	11.88	...	13.00	11.38	11.00	10.38	10.63	10.13	10.75	10.38	16.25	10.25	10.63	6.88	8.25	6.75	9.75	8.25	25.50	9.00	9.25	9.00	56,236
*Mong. Riv. C. & C. pf.	100	40.00	39.00	40.25	39.50	43.50	39.00	40.00	39.00	40.00	39.50	40.63	39.75	38.00	38.38	37.50	41.00	35.00	27.00	28.00	25.50	29.00	27.00	20,581
†National Lead	100	26.00	26.00	29.38	26.00	28.38	18.88	26.25	23.00	24.50	17.50	17.38	15.38	17.63	11.88	13.00	15.00	12.13	11.50	15.00	10.50	17.25	13.50	140,051
†National Lead pf.	100	93.00	91.25	95.00	90.00	94.00	84.50	91.88	90.00	90.50	85.75	86.50	83.25	85.00	79.75	86.00	81.00	84.75	80.00	82.75	75.00	81.25	70.50	21,403
‡Penn. Steel pf.	100	93.25	90.50	92.63	90.50	94.00	91.50	95.00	91.50	93.00	90.00	90.00	88.00	87.00	...	85.00	82.00	85.00	80.00	...	...	76.00	70.00	6,326
*Phila. Nat. Gas	100	49.00	45.00	47.50	45.00	48.50	45.00	46.50	44.00	48.00	35.63	47.00	40.00	39.13	45.00	47.00	37.75	44.00	37.00	43.50	42.00	42.00	31.50	41.88	36.50	36,246
*Phila. Nat. Gas pf.	50	...	...	91.38	...	...	...	...	...	85.50	84.50	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1,123
*Pittsburg Coal	100	30.00	27.75	30.00	28.25	30.00	27.63	30.75	28.00	29.88	29.00	28.13	26.00	28.50	20.00	34.50	25.50	36.00	23.00	25.88	16.00	20.00	18.50	18.75	15.50	177,874
*Pittsburg Coal pf.	100	90.00	87.63	92.88	89.50	91.50	89.50	90.38	80.00	89.00	86.58	87.00	80.00	83.00	78.00	81.50	75.00	83.00	65.25	69.50	59.75	62.50	59.88	61.00	56.00	75,615
†Republic I. & Steel	100	22.13	20.25	22.63	21.00	21.63	17.75	20.13	17.88	19.88	14.88	16.00	13.50	15.00	11.88	19.25	13.00	15.00	9.00	10.00	7.13	7.88	5.75	7.63	6.00	317,576
†Republic I. & Steel pf.	100	79.50	75.00	80.38	78.75	79.88	74.25	79.00	75.88	78.75	74.75	76.25	70.00	74.50	69.00	67.00	57.00	69.00	59.38	63.00	50.50	52.00	38.50	43.25	38.00	381,123
†Sloss-Sheffield S. & I.	100	68.50	59.50	72.00	66.25	71.00	63.00	64.75	53.00	62.50	48.00	47.50	38.50	40.50	26.00	39.00	29.00	34.50	25.50	28.50	23.00	25.00	23.00	33.50	25.00	115,575
†Sloss-Shef'ld S. & I. pf	100	93.50	90.50	97.50	93.50	96.00	83.00	94.00	91.00	92.00	87.00	88.00	87.00	88.00	80.00	83.25	80.00	85.00	70.00	71.00	65.50	70.00	66.25	80.00	70.00	6,025
†Standard Oil	100	750.00	715.00	742.00	690.00	696.25	634.00	680.00	655.00	690.00	638.00	651.00	636.00	694.50	580.00	918.00	515.00	618.00	598.00	694.50	610.00	680.00	645.00	674.50	645.00	13,333
†Tenn. C. I. & R.	100	65.00	59.75	67.38	63.00	71.75	61.25	66.50	61.00	65.00	54.00	55.00	47.75	58.00	36.00	47.63	32.75	43.00	30.13	34.50	26.25	29.75	25.88	42.00	28.50	1,000,548
†U. S. Red. & Ref.	100	36.00	32.50	35.25	34.50	40.50	29.00	32.00	30.00	32.00	30.00	31.00	...	28.13	26.00	28.00	26.00	29.00	26.00	28.00	26.00	28.00	26.00	29.00	26.00	1,500
†U. S. Red. & Ref. pf.	100	57.00	51.00	55.00	54.00	60.00	53.00	...	...	...	...	48.00	...	48.00	46.00	48.00	46.00	48.00	46.00	48.00	46.00	48.00	46.00	48.00	46.00	3,000
†U. S. Steel	100	39.00	36.50	39.88	37.13	42.13	36.00	37.88	34.00	35.63	30.50	32.13	28.38	31.63	29.00	30.00	27.00	30.00	27.00	28.00	26.00	28.00	26.00	28.00	26.00	6,495,445
†U. S. Steel pf.	100	89.75	86.25	89.63	87.00	94.13	85.38	87.13	83.00	85.13	80.00	82.50	78.75	82.00	78.00	82.00	78.00	82.00	78.00	82.00	78.00	82.00	78.00	82.00	78.00	7,796,668
†Va.-Car Chem.	100	64.50	61.75	66.63	63.50	69.63	62.88	68.88	63.75	66.00	58.00	62.50	52.00	58.00	50.00	58.00	50.00	58.00	50.00	58.00	50.00	58.00	50.00	58.00	50.00	326,638
†Va.-Car Chem. pf.	100	128.00	121.00	128.50	126.00	133.25	125.00	125.00	121.00	125.00	119.00	120.00	116.88	120.00	116.00	120.00	116.00	120.00	116.00	120.00	116.00	120.00	116.00	120.00	116.00	24,347

†New York Stock Exchange. ‡Philadelphia Exchange. *Pittsburg Exchange. Total sales....18,998,580

FLUCTUATIONS IN MINING STOCKS AT COLORADO SPRINGS, COLO., IN 1903.*

Name of Company.	Par value.	January. H.	January. L.	February. H.	February. L.	March. H.	March. L.	April. H.	April. L.	May. H.	May. L.	June. H.	June. L.	July. H.	July. L.	August. H.	August. L.	September. H.	September. L.	October. H.	October. L.	November. H.	November. L.	December. H.	December. L.	Sales.
Acacia	$1	.09½	.06¾	.10½	.08½	.10	.07	.09¾	.08	.10	.08	.09½	.07½	.08½	.06	.07½	.05	.08	.05¾	.08	.06	.07	.05	.07	.05	160,290
Anaconda	1	.20½	.10	.20¼	.13	.20	.13	.20	.13	.26	.13½	.20	.12	.15	.06¼	.12½	.10	.15	.10	.13½	.10	.13	.10	.09	.05	49,000
C., K. & N.	1	.24	.11½	.21	.16½	.20½	.14	.22	.18	.22	.16¼	.18	.09	.23	.20¼	.20½	.17	.20	.16	.22	.18	.09	.04	.07	.03	455,700
Doctor-Jack Pot	1	.11	.09¾	.12¼	.02½	.10¼	.08¾	.10	.08¾	.10	.08¼	.08	.07½	.09½	.08¾	.09	.06	.08	.06	.10	.06	.08	.05	.08	.05	240,581
Elkton Con.	1	.37½	.30	.40	.35	.39	.24	.38	.36	.41	.37	.44	.39	.40	.40	.44	.39	.50	.41	.50	.41½	.45	.40	.50	.43½	372,141
El Paso	1	.70	.59	.68½	.59	.60½	.55¾	.62	.58	.65	.58¼	.64	.60	.65	.55	.70	.60	.70	.60	.70	.53¾	.63	.50	.60	.47	339,401
Gold Dollar	1	.06½	.05¾	.05	.05	.05¾	.04¾	.05¾	.05	.07½	.05¾	.07	.05¾	.06¼	.04¾	.06¾	.04¾	.06¾	.04¾	.06¾	.04¾	.06	.04¾	.06	.04¾	720,604
Golden Cycle	1	.72½	.50	.80	.70	.80	.65	.77	.70	.76	.63½	.72	.66	.72	.62	.75	.63½	.72	.63½	.65	.58	.68	.55	.73	.65	174,100
Golden Fleece	1	.25	.05	.25	.06	.20	.07	.12	.06½	.11	.05	.11	.06	.10	.06	.10	.06	.10	.06	.10	.06	.12	.06	.12	.06	14,500
Isabella	1	.15⅜	.12	.10	.05	.10	.05	.12	.09	.12	.09	.17	.10	.15	.10	.13½	.10	.15	.10	.12	.09	.17	.10	.16	.16½	33,300
Jack Pot	1	.13	.08	.12	.06	.11	.08	.10	.08	.10	.08	.10	.08	.10	.08	.10	.08	.10	.08	.10	.08	.10	.08	.10	.08	22,100
Last Dollar	1	.85	.20	.65	...	.70	.10	.67	.08	.70	.20	.60	.49	.75	.32	.80	.48	.80	.50	.80	.50	.80	.50	.80	.46	43,250
Mollie Gibson	5	.06¾	.05¾	.10	.05	.10	.05	.07	.05	.07½	.05	.07	.05¾	.06¾	.05¾	.06¾	.05	.06¾	.05	.06¾	.05	.06¾	.05	.06¾	.05	100,200
Moon Anchor	5	.15	.06	.18½	.07½	.10½	.07¼	.09	.05¾	.09	.07	.09	.07	.09	.06	.09	.06	.09	.06	.09	.06	.11	.08	.11	.08	114,860
Portland	1	1.90	1.04	1.65	1.25	1.40	1.25	1.45	1.30	1.41	1.20	1.40	1.23	1.40	1.11	1.35	1.15	1.48	1.10	1.30	1.00	1.12	.85	.90	.75	59,000
Vindicator Con.	1	1.07	.95	1.10	1.00	1.10	.90	1.05	.88	1.00	.97	.96	.92	.96	.90	.96	.90	.96	.90	.96	.90	.96	.80	.96	.75	102,500
Work	1	.07¾	.06¾	.07¾	.06¾	.07¼	.05½	.07	.06	.07	.06	.06¾	.05	.06¾	.04	.06¾	.04	.06¾	.04	.06¾	.05	.06¾	.04¾	.06¾	.03¾	3,575,437

Quotations are for the principal stocks dealt in on the Colorado Springs Mining Stock Exchange. Total sales.....3,575,437

FLUCTUATIONS IN MINING STOCKS AT NEW YORK IN 1903.

Name of Company.	Par value.	—January.— H.	L.	—February.— H.	L.	—March.— H.	L.	—April.— H.	L.	—May.— H.	L.	—June.— H.	L.	—July.— H.	L.	—August.— H.	L.	—September.— H.	L.	—October.— H.	L.	—November.— H.	L.	December. H.	L.	Sales. Shares.
Acacia, g., Colo.	$1	.09	.08	.08½	.08	.08½	.04	.09	.08	.08½	.07½	.08	....	....	....	.07	.06	....	....	.07	.06	....	....	.06	.05	42,600
Adams, g., Colo.	10	....	....	....	....	....	....	....	....	....	....	.10	....	.10	....	....	....	.15	....	....	....	....	....	....	....	850
Alice, g. s., Mont.	25	.30	.28	.45	.35	.45	.35	.30	.25	.35	....	....	....	....	....	.20	....	....	....	.18	....	.19	....	.17	....	5,078
Alta, s., Nev.	1	.18	....	....	....	....	....	....	....	.04	....	.04	....	.05	....	.06	.05	....	....	.04	....	.02	.01	.04	.02	8,100
Amalgamated, c., Mont.	100	67.38	62.75	75.25	66.12½	75.62½	70.75	67.50	60.00	67.25	56.75	58.12½	51.00	56.50	35.75	59.00	37.00	49.12½	37.37½	42.37½	33.62½	39.62½	35.37½	52.62½	38.00	11,209,606
*Anaconda, c., Mont.	25	101.25	95.00	125.50	100.12½	125.50	113.50	115.75	100.50	107.25	85.00	92.62½	83.00	88.00	64.00	86.50	66.00	83.00	68.00	72.00	58.00	70.50	62.00	82.00	64.25	251,835
Anaconda, g., Colo.	5	.20	.18	....	....	.15	....	.18	.05	.14	....	.20	.08	.18	.12	.13½	.10	.14½	.12	.13	....	.11	....	.12	....	18,800
Andes, s., Nev.	1	.07	....	....	....	....	....	....	....	.27	.19	.16	.15	.10	.08	.14	....	.16	.15	.20	....	.14	.12	.27	.20	7,000
Belcher, s., Nev.	3	1.50	.52	.60	....	.65	.62	....	....	.53	....	.45	.42	.50	.46	....	....	.27	....	1.50	....	.13	.12	.25	.20	5,950
Best & Belcher, Nev.	3	4.35	1.05	3.00	2.15	2.60	2.20	2.10	1.65	1.75	1.50	2.35	1.50	2.25	....	1.95	1.60	1.80	1.40	1.50	1.30	1.40	1.23	2.15	1.90	8,380
Breece, s. l., Colo.	25	.50	....	.70	.65	....	....	.30	....	.28	....	.25	....	.20	....	22	.20	.20	....	.18	.15	.12	....	....	....	1,670
Brunswick Con. g., Cal.	1	.09	.06	.06	.05½	.06	.02	.02	....	.04½	....	.04½	.04	.04½	....	.06½	.03	.05	.03½	.05	....	.02	.01½	.05½	.04	48,450
Bullion, s., Nev.	1	....	....	.10	....	.13	.09	.11	.08	.08	.07	.06	....	....	....	....	....	.15	.14	.13	.09	.07	....	....	....	16,014
Caledonia, s., Nev.	1	2.75	2.50	2.50	2.00	2.90	1.65	2.65	2.55	2.15	1.50	1.60	1.50	1.45	1.40	1.41	....	1.00	.80	1.00	....	1.20	1.00	1.10	.80	9,360
Challar, s., Nev.	2½	.70	.32	.46	.39	.45	.40	.33	.25	.36	.21	.36	.25	.20	....	.20	.10	.25	.09	.21	.10	.18	.09	.30	.18	34,500
Chrysolite, s. l., Colo.	50	....	....	....	....	.06	....	.07	.03	....	....	....	....	....	....	.06	....	.06½	.06	....	....	....	....	....	....	8,400
C. K. & N., g., Colo.	1	.21	....	.20	....	.20	....	.22	.20	.22	.18	.22	.18½	.22	....	....	....	....	....	.22	.18	.70	.20	.18½	....	21,120
Comstock Tun., Nev.	2	.12	.06	.15	.08½	.15	.09	.10	.06½	.08½	.06½	....	....	....	....	.08	.05½	....	....	....	....	....	....	....	....	333,240
Com. Tun., Nev., bonds.	100	.10	.06	.12	.08	.12½	.09½	.08	.05½	.08	.06	....	....	....	....	.07½	....	....	....	....	....	....	....	....	....	244,200
Confidence, s., Nev.	3	1.50	....	1.60	....	1.60	....	....	....	....	....	1.25	....	1.35	1.25	1.30	1.05	.75	....	.60	.59	.55	.50	....	....	3,300
Con. C. & V., s. q., Nev.	2½	3.10	1.25	2.50	2.00	2.30	2.00	1.60	1.30	2.10	1.15	2.00	1.55	1.85	1.25	1.50	1.30	1.55	1.25	1.35	1.10	1.15	.91	.85	....	55,758
Con. Imperial, s., Nev.	1	.12	.03	.06	.05	.06	.05	.04	....	.08	.02	.09	.07	.08	.06	.07	....	.06½	.05	.05	.04	.09	.03	1.35	.92	55,758
Crip. C'k Con, g., Colo.	1	.08½	.06	.06½	.05	.06	.05	.06	.04½	.05½	.05	.05½	.01½	.03½	.01½	.04	.02½	....	....	.04½	.03	.03	....	.05½	.04½	55,930
Crown Point, g. s., Nev.	1	.52	.20	....	....	.46	.38	....	....	....	....	....	....	.26	.25	.16	.15	.25	.10	.24	.16	.15	.14	.04	....	36,300
Daly, g. s., Utah.	20	3.00	1.90	5.00	3.75	4.15	3.10	2.75	1.75	2.25	....	....	....	2.00	1.75	2.10	1.80	1.80	1.60	2.00	1.90	1.55	1.15	.18	.15	13,700
Dr. Jack Pot, g., Colo.	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.10	....	....	....	....	....	1.70	1.40	3,920
Dunkin, s., Colo.	1	....	....	....	....	.10	....	.10	....	....	....	....	....	....	....	.08	....	.10	.05	....	....	....	....	....	....	1,000
Elkton Con., g., Colo.	1	.38	.30	.40	.29	.40	.30	.40	.37	.42	.35	.60	.40	.50	.43	.47	.37	.50	.40	.50	.42	.45	.37	....	....	3,000
El Paso, g., Colo.	1	....	....	....	....	.55	....	.63	.55	.60	.58	.60	....	.60	....	.60	.58	....	....	....	....	.50	....	.44	.41	67,890
Eureka, g. s., Nev.	20	....	....	....	....	....	....	....	....	....	....	....	....	.24	....	....	....	.25	.11	.58	.52	....	....	.50	.48	10,350
Gold Dollar, g., Colo.	1	.06	....	....	....	.05	....	.05½	.05	.05½	.05	.04½	....	.04½	....	.05	.04½	.04½	....	.05	.04½	.03½	....	.50	....	1,100
Golden Fleece, g. s., Colo.	1	....	....	....	....	....	....	....	....	.15	....	.15	....	.12	.08	.08½	.08	.10	.07½	.07	....	.08	....	.03	....	31,000
Gould & Curry, s., Nev.	1	1.00	.38	1.00	.55	.56	.39	.40	.27	....	....	.45	.43	.40	.38	.41	.40	.30	.25	.25	.21	.22	....	.08	.06	10,500
Greene Con., c., Mex.	10	25.00	14.88	27.13	21.00	27.25	24.75	24.75	22.00	23.00	15.00	22.75	19.00	23.12½	17.25	19.87½	15.25	20.00	16.25	18.50	13.37½	16.75	11.75	.40	.35	12,700
Hale & N'ross, g. s., Nev.	3	1.25	.57	1.25	1.05	1.20	1.10	.75	.62	.74	.55	.75	.68	.80	.51	.50	.47	.58	.46	.58	.52	.58	.43	14.00	10.75	766,51'
Homestake, g. s., Dak.	100	....	....	....	....	69.75	65.00	65.00	60.00	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.63	.44	20,920
Horn Silver, s. l., Utah.	20	....	....	1.50	1.25	1.40	1.00	....	....	1.30	1.25	1.25	1.15	1.15	....	1.21	....	1.25	1.10	1.05	....	1.05	....	51.00	....	410
Iron Silver, s. l., Colo.	20	.77	....	....	....	1.00	....	1.60	....	1.55	....	....	....	1.85	1.80	1.85	1.70	1.40	....	1.90	1.75	1.80	1.00	1.25	1.05	7,050
Isabella, g., Colo.	1	.30	.14	.28	.22	.25	.20	.21	.17	.19	.17	.18	.16½	.21	.20	.14½	.10	.16	.10	.12½	.10	.11	.09	2.00	....	2,160
Jack Pot, g., Colo.	1	.30	.11	.13	.12½	.12	....	.18	.10	.07½	....	....	....	.10	.09½	11	....	.09	.06	.09	.07½	....	....	.09	.07½	86,230
Julia, s., Nev.	1	.09	....	.08	.07	.09	....	.04	....	.04	....	....	....	....	....	....	....	.02	....	.07	....	....	....	.05	....	20,790
Justice, s., Nev.	2	.40	.15	.15	.10	.20	.05	.18	.12	.12	.06	.16	.11	.16	.13	.14	.13	.15	.09	.09	.07	.05	....	.15	.11	6,600
Kentuck Con., s., Nev.	1	.12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	35,890
King. & Pem., i., Ont.	10	....	....	....	....	....	....	.10	....	....	....	....	....	.04	....	....	....	....	....	....	....	....	....	....	....	200
Leadville, s. l., Colo.	10	....	....	....	....	.04	.03	.04	.03	....	....	.04	.03	.03	....	.03	....	.04	.02	....	....	.04	....	....	....	3,600
Little Chief, s. l., Colo.	50	....	....	.09	....	.09	....	.09	.08	....	....	.08	....	.07½	....	.09	.07	.09	.06	.08	.06	.08	....	.08	....	11,300
Mexican, g. s., Nev.	3	3.00	.70	1.65	1.45	1.65	1.45	1.10	.98	1.10	.70	1.30	1.10	1.80	1.00	1.30	.95	1.50	1.00	1.10	.88	.95	.60	.04	....	12,775
Mollie Gibson, s., Colo.	5	.07	....	.08	.06½	.08	.06½	.08	.06	.08	.05½	.07	.06½	.05	....	.06	....	.06	.03½	.08	.04½	.07	.05	1.45	.90	28,500
Moon Anchor, g., Colo.	5	.12	.08	.09½	....	.08	....	.10	.08	.09	.08	.09	.08	.08½	.08	.09	.08½	.09½	.09	.13	.11	.11	.10	.07½	.06	62,801
Moulton, g., Mont.	25	....	....	.28	....	....	....	....	....	....	....	....	....	....	....	....	....	.25	....	.25	....	.15	....	.09	....	24,300
Occidental Con., s., Nev.	3	2.00	.20	.50	....	.50	....	.45	.40	.45	....	.33	.24	.35	.30	.40	.33	.40	.30	.26	.24	....	....	....	....	1,500
Ontario, s. l., Utah.	100	6.50	6.00	7.50	5.75	7.00	5.75	6.25	5.13	6.50	5.12½	5.75	....	5.75	....	....	....	6.00	4.50	5.50	4.50	5.25	....	.50	.46	8,750
Ophir, g. s., Nev.	3	3.20	1.40	2.75	2.10	2.40	2.00	1.80	1.45	2.11	1.40	2.11	1.35	1.75	1.40	1.75	1.50	1.90	1.55	1.65	1.00	1.90	1.30	6.00	5.25	6,662
Overman, s., Nev.	2	.75	.55	.72	.68	.72	.53	....	....	....	....	.45	.42	.35	.25	.30	....	.33	....	.24	.23	.22	....	2.40	1.80	30,990
Pharmacist, g., Colo.	1	.06½	.04½	.05½	....	.05½	.04	.05	.03½	.03½	....	.03½	....	.03½	.02½	.04	.02½	.04	.02½	.02	....	.02	.01½	.26	.15	6,000
Phoenix Con., g., Ariz.	1	.07	....	....	....	.06	....	....	....	....	....	....	....	.07	....	.04	....	....	....	.05	.04	.03	.02½	.14	.02	73,955
Portland, g., Colo.	1	1.85	1.70	1.75	1.40	1.50	1.23	1.45	1.40	1.45	1.30	1.40	1.07	1.37	1.20	1.21	1.10	1.90	1.18	1.25	1.10	1.15	.95	.20	.05	77,520
Potosi, s., Nev.	1	1.00	.20	.70	.52	.56	....	.29	.18½	.38	.25	.39	.19	.33	.20	.22	.12	.30	.11	.24	.18	.18	.09	.19	.95	35,455
Quicksilver, Cal.	100	2.85	2.00	3.00	1.63	1.88	....	1.75	1.50	2.50	....	....	....	....	....	2.00	....	....	....	....	....	4.00	....	.30	.18	55,810
Quicksilver, pf., Cal.	100	8.00	7.00	....	....	7.25	....	7.25	....	....	....	....	....	....	....	....	....	5.25	....	6.50	6.25	5.50	....	2.00	....	2,320
Savage, s., Nev.	3	.95	.33	.46	.38	.41	.37	.30	....	....	....	.24	....	.23	.15	.26	.22	.39	.20	.26	.19	.16	.14	5.50	....	1,720
Sierra Nevada, s., Nev.	3	1.80	.75	1.00	....	1.15	1.00	.92	.90	.81	.58	.35	.11	.65	.52	.65	....	.61	.60	.53	....	.42	.30	.65	.36	17,200
Silver Hill, g. s., Nev.	1	....	....	....	....	.64	.56	.89	.72	1.50	.85	1.35	.90	.90	.72	.75	.30	.71	.68	.65	.58	.65	.53	.55	....	10,600
Small Hopes, s. l., Colo.	20	.30	....	....	....	.45	.40	.90	.50	.52	.45	.35	.30	.30	....	.70	....	.32	.30	....	....	.25	....	.30	.20	6,900
Standard Con., g. s., Cal.	10	....	....	....	....	3.50	3.00	3.40	3.00	3.00	....	3.00	....	3.00	....	2.25	2.00	3.00	2.00	3.00	2.25	2.40	2.25	2.00	....	3,490
Syndicate, g., Cal.	1	.06	....	....	....	.08	....	....	....	....	....	.07	....	....	....	.06	....	....	....	.05	....	.04	.03	.04	....	6,000
Tennessee, c., Tenn.	25	25.00	15.75	31.00	25.00	34.25	29.50	30.63	27.75	29.25	22.00	30.00	27.50	32.00	24.00	29.50	25.00	29.00	26.00	32.50	26.00	30.50	27.00	30.50	27.00	400,125
Union Con., s., Nev.	1	2.25	.50	1.25	1.20	1.25	....	1.00	.90	1.00	.86	1.00	.88	.90	.75	.78	.68	.85	.60	.60	.53	.50	.34	.80	.48	13,108
Union, c., N. C.	25	2.88	2.25	3.25	2.50	3.00	1.38	3.00	2.12½	2.50	1.62½	1.37½	1.25	1.50	.87½	1.25	.75	1.25	.75	1.00	.75	.75	.50	.69¾	.43¾	150,276
United com., c., Mont.	100	....	....	....	....	....	....	....	....	....	....	18.75	18.00	19.75	15.00	16.12½	15.25	15.87½	13.50	16.75	14.50	17.00	10.00	9.25	8.50	20,951
Utah, s., Nev.	1	.55	....	1.40	....	1.40	....	.40	.31	.20	....	....	....	.34	....	....	....	.14	.13	....	....	.15	....	.17	.16	3,800
Vindicator Con., g., Colo.	1	....	....	....	....	....	....	....	....	.95	.85	.85	....	.83	.80	.75	....	....	....	....	....	....	....	....	....	2,600
White Knob, c., Idaho.	10	12.13	9.50	13.75	11.00	11.25	10.00	13.37½	10.00	19.62½	12.12½	15.50	12.00	14.25	11.00	12.00	8.75	10.50	8.50	11.00	8.87½	10.00	8.75	10.00	8.25	81,399
Work, g., Colo.	1	.08	.07	.08	.06½	....	....	.06½	.06	....	....	.06	....	....	....	.06	.05	.06½	....	.06½	.06	....	....	.09	.04	22,100
Yellow Jacket, s., Nev.	3	.93	.45	.40	.85	.65	.80	.64	.67	.40	.55	.52	.63	.55	.30	....	.56	.49	....	.49	.40	.33	.30	....	....	8,841

*Quotation in per cent. c.—Copper. g.—Gold. i.—Iron. l.—Lead. q.—Quicksilver. s.—Silver.

Total sales.....14.706,127

FLUCTUATIONS IN MINING STOCKS AT SALT LAKE CITY IN 1903.

Name of Company.*	Par value.	—January.— 3.	7.	—February.— 7.	21.	—March.— 7.	21.	—April.— 4.	18.	—May.— 2.	16.	—June.— 6.	20.	—July.— 4.	18.	—August.— 1.	15.	—September.— 5.	19.	—October.— 3.	17.	—November.— 7.	21.	—December.— 5.	19.	Year. H.	L.
Century	1	.90¼	.90	.90	.72½	.72½	.40	.47½	.47½	.75	....	....	....	....	.43½	.39	.38	.37	....	.50	.49½	....	.60	.65	.62½	.90¼	.37
Con. Mercur	5	1.70½	1.67	1.69½	1.70	1.65	1.53	1.50	1.46	1.34½	1.21	1.23	1.29	1.45	1.49	1.51½	1.51	1.45½	1.80	1.05	1.09½	.92	.70	.86½	....	1.80	.70
Daly Judge	10	9.55	10.12½	10.10	9.87½	10.15	10.50	9.90	8.55	9.20	9.20	10.50	10.75	10.75	10.00	9.20	9.25	8.80	8.32½	9.40	8.60	11.00	8.50	7.50	3.75	11.00	3.75
Daly West	20	39.20	42.00	39.00	38.92½	38.10	38.85	42.07½	42.47½	44.55	47.00	45.55	40.50	42.00	40.25	38.25	38.40	39.37½	39.00	38.50	38.50	37.25	32.50	35.10	34.00	47.00	32.50
Grand Central	1	4.50	5.40	5.15	5.22½	5.25	5.10	5.20	5.20	4.97½	4.87½	4.70	....	4.50	4.25	4.30	4.10	....	4.32½	4.00	....	4.37½	3.80	....	....	5.40	3.80
Lower Mammoth	1	.67½	.64	....	69½	.59	.56¾	.48⅝	.37½	.53	1.15	1.44	.91½	.68½	.86	.76	.67	.70½	.71	.58	.44½	.32½	.33	.37¾	.39	.22	.06⅝
May Day	¼	.16	.17	.15	.15¾	.14	.16⅞	.18¾	.16	.15	.19¾	.22	.19¾	.18	.17	.13	.09	.09⅜	.08⅛	.08½	.08	.08	.06⅝	.07	.08½	.22	.22½
Sacramento	5	....	.25	.25½	.26⅞	.26½	.26⅝	.26¾	.26½	.27½	.25¾	.25	.24½	.22½	.23⅞	.23½	.23¾	.26¼	.28	.26¼	.26¾	.25	.23½	.23	.20⅛	.28	.22½
Silver King	20	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	70.00	....	....	....	....	65.00	70.00	65.00
Star Consolidated	1	.11	.13	.12½	....	....	.9½	.13½	.14	.15	.24	.30¼	.27¼	.23½	.28¼	.25½	.17¾	.13½	.33¼	....	.33	.31	.25	.20	.21½	.33¼	.09¼
Tetro	1	....	....	....	....	....	.19	....	....	....	....	....	....	....	....	....	....	....	.33	.30	.29	.33¼	.28¾	.28	.28	.33	.19
Yankee Consolidated	1	.40	.43	.36	.43¾	.39¾	.39	.39½	.33	.28	.36	.39	.37	.33½	.36	.30	.28½	....	.58	.45	.41½	.42	.40	.36	.38	.58	.28

*All mines are in Utah. Quotations are bids at the close on the first and third Saturdays in the month.

THE BOSTON MINING STOCK MARKET IN 1903.

BY OUR SPECIAL CORRESPONDENT.

There are listed on the Boston Stock Exchange 72 different mining stocks, including preferred shares in one or two cases. Of this number, 17 paid dividends during 1903 and eight levied assessments. The dividend payers were Calumet & Hecla, Granby, North Star Mines, Trimountain, up to the time it was merged into Copper Range, Wolverine, Amalgamated, Anaconda, Central Oil, Consolidated Mercur, the latter monthly up to May, Continental Zinc, Daly West, Dominion Coal and preferred, New Idria Quicksilver, Tennessee Copper and Utah Consolidated. The Dominion Coal dividends were passed late in the year. Adventure, Mass, Michigan, Mohawk, Old Colony, Phœnix, Victoria and & Winona, all of which are new mines, levied assessments or calls. Two of these, Michigan and Phœnix, have become producers during the year. companies paid regular dividends. The Utah Consolidated paid $3 per share. Amalgamated Copper has been the most active stock in the market, with close to 1,500,000 shares for the year, and Copper Range second, with about 1,000,000 shares. Utah Consolidated was third, with about 400,000 shares, followed by United States, with close to the same number, and Centennial with something over 300,000 shares. In looking the active list over, it is found that but five companies are selling above the closing price of 1902. Allouez is less than $1 higher, American Zinc about $5 higher, Utah $5 higher, Winona $2 higher and Wolverine $3 higher.

Taken as a whole, the year has been unsatisfactory for both holders of stocks and broker. A fair-sized boom started in the spring, but soon disappeared, and almost utter stagnation followed. Calumet & Hecla showed a range of $111 from $551 to $440, for the year. Tamarack $190 and $75 for ex-$20. The company apparently has not a sufficient amount of ore blocked out, although the management has been acquiring new properties. Centennial, it is expected, will have to levy another assessment to build a mill. The stock sold as low as $12.50 and closes but a few dollars higher. Franklin, once a dividend payer, sold down to $6.75. Quincy's net profits for the year are figured close to $700,000, with about $6 per share earned, allowing $100,000 for construction. Several improvements at the mine will bring the cost down to a minimum. There is about $600,000 in the treasury.

Old Dominion has not proven the bonanza expected by the so-called reformers. Poor business judgment has been responsible. Many reforms were brought about, but money was spent recklessly, and the copper produced has apparently cost more than it brought. The effort to consolidate with the Phelps-Dodge United Globe property met a rebuff

FLUCTUATIONS IN MINING STOCKS AT BOSTON IN 1903.

Name of Company.	Par Value.	January. H.	January. L.	February. H.	February. L.	March. H.	March. L.	April. H.	April. L.	May. H.	May. L.	June. H.	June. L.	July. H.	July. L.	August. H.	August. L.	September. H.	September. L.	October. H.	October. L.	November. H.	November. L.	December. H.	December. L.	Sales.
Adventure (F)	$25	18.00	14.00	16.75	12.00	13.25	10.00	10.50	9.00	9.25	7.00	7.00	5.00	6.00	3.75	6.75	5.00	6.00	4.75	5.00	3.00	4.50	3.50	3.50	2.00	50,070
Aetna (C)	5	...	...	...	...	...	...	1.00	.75	.75	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	650
Allouez (F)	25	5.31	3.13	6.94	4.50	7.38	4.50	7.50	5.75	7.25	5.50	6.75	5.00	6.25	4.25	6.00	4.50	5.50	4.25	5.50	3.13	5.00	4.00	5.00	4.25	152,262
Amalgamated (H)	100	67.37	62.50	79.50	66.00	74.50	64.75	67.63	60.25	67.25	56.58	58.00	51.25	56.25	36.00	50.75	37.00	50.00	37.50	42.50	33.75	40.00	35.50	52.63	38.13	1,717,341
Am. Gold Dredg. (D)	5	...	...	...	...	...	...	...	...	...	...	1.00	.50	...	...	1.00	.75	1.00	...	1.00	...	...	...	...	...	3,035
Am. Z., L. & Sm (G)	25	7.50	6.00	11.50	7.50	12.75	8.50	11.75	10.00	12.62	10.00	9.50	...	9.00	8.00	9.00	8.00	9.50	7.25	9.25	6.50	11.00	8.50	11.50	10.00	22,607
Anaconda (H)	25	25.75	23.50	30.50	25.00	31.12	27.00	29.00	25.00	25.00	24.38	21.88	21.00	21.00	15.63	21.00	18.88	18.00	16.25	16.00	...	17.75	17.00	20.00	17.00	7,791
Arcadian (F)	25	5.62	4.00	6.13	4.50	5.00	4.13	4.50	3.50	4.00	2.62	3.00	2.00	2.50	1.50	2.25	1.50	1.75	1.00	1.00	.75	1.00	.75	1.00	.80	82,842
Arnold (F)	25	.50	.40	.75	...	.95	.75	.75	.25	.50	...	.25	...	.25	...	.50	...	.50	.25	...	...	...	...	...	...	4,582
Atlantic (F)	25	10.00	8.00	13.50	9.00	14.00	11.00	13.00	11.50	12.50	9.50	15.00	9.00	10.00	8.00	10.00	8.25	9.25	8.00	8.75	7.00	8.50	7.00	8.50	7.50	34,087
Bingham (L)	50	34.00	29.00	39.00	33.50	35.13	30.13	32.38	32.00	31.38	27.00	28.75	25.25	28.00	20.25	26.75	21.25	26.38	20.75	24.38	20.50	23.00	21.00	23.25	20.00	126,200
Bonanza (L)	10	.95	.65	.84	.80	.90	.65	.80	.60	.65	...	.70	.60	.65	.50	.55	.50	.55	.50	.55	.45	.50	.45	.45	.40	16,314
Breece (D)	25	.70	.60	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	200
Br. Columbia (B)	5	5.50	4.50	7.50	6.50	6.63	6.00	...	...	5.25	5.00	...	...	4.00	...	...	...	3.50	...	2.50	...	...	...	...	...	2,018
Calumet & Hecla (F)	25	544	495	550	500	550	515	530	515	530	514	503	430	465	400	485	420	470	425	470	425	450	425	445	420	5,371
Centennial (F)	25	26.75	19.25	31.75	24.75	31.00	24.00	28.25	20.50	26.75	19.25	22.00	17.25	20.00	12.00	22.50	14.00	20.75	14.75	18.00	14.00	17.00	14.25	17.25	14.25	301,086
Central Oil (M)	25	7.50	6.50	7.38	7.00	7.25	7.00	7.00	6.25	7.13	6.75	7.38	6.38	10.00	7.00	8.50	7.50	8.25	5.75	7.00	6.75	7.00	6.25	6.75	6.00	9,086
Con. Mercur (L)	5	1.88	1.50	1.75	1.38	1.75	1.50	1.57	1.38	1.50	1.25	1.50	1.25	1.63	1.38	1.62	1.53	1.53	1.00	1.25	1.00	1.00	.70	1.00	.70	171,772
Continental Zinc (G)	25	15.00	...	15.00	...	16.00	...	14.00	13.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	240
Copper Range (F)	100	66.50	58.75	75.00	64.25	72.00	61.50	68.00	56.00	66.25	56.38	58.00	50.38	54.75	37.00	69.25	39.75	66.75	46.00	52.00	42.25	48.25	40.50	48.75	42.00	1,226,030
Daly West (L)	20	44.00	36.50	42.00	38.50	42.75	38.50	48.00	41.50	48.56	45.00	47.50	40.50	43.75	37.50	41.50	36.00	43.00	38.00	40.50	37.50	38.00	30.50	36.50	33.00	46,749
Dominion Coal (J)	100	132.25	130.00	129.25	118.50	126.00	106.00	112.00	102.00	110.00	86.00	99.00	70.00	106.25	88.50	95.50	77.00	85.50	68.00	73.88	60.50	76.50	70.00	78.00	72.25	143,682
Dominion Coal pf (J)	100	...	...	117.50	116.50	117.50	115.00	118.00	116.00	117.50	115.00	114.00	112.00	115.00	112.00	112.50	104.25	110.00	108.00	110.00	106.50	110.00	109.00	115.00	110.25	2,330
Dominion Iron & St (J)	100	62.75	55.00	55.75	52.00	60.00	25.25	32.25	24.00	30.38	13.00	18.50	11.75	21.50	11.00	12.00	8.00	15.00	9.25	11.75	7.25	10.00	6.50	10.50	7.75	267,606
Elm River (F)	12	3.75	2.50	4.38	3.13	5.38	2.75	4.50	3.25	4.25	3.00	3.63	2.25	3.00	2.50	3.75	2.62	3.00	2.25	2.88	2.00	2.50	2.13	2.25	2.06	67,078
Franklin (F)	25	11.00	9.88	14.00	10.00	12.25	10.25	12.00	10.00	11.00	9.00	9.75	8.00	9.00	6.75	8.75	7.25	8.63	8.00	8.00	7.00	8.25	7.25	8.50	7.25	23,377
Granby Con. (B)	10	...	...	...	...	...	...	5.25	4.75	5.06	4.75	5.00	4.00	4.25	3.75	4.38	3.75	4.12	3.63	4.25	3.75	4.50	4.00	4.75	3.88	53,639
Guanajuato (E)	5	3.00	2.50	3.00	2.50	3.00	1.50	2.25	1.25	2.13	1.50	2.00	1.25	1.50	1.00	1.25	1.00	1.00	.75	1.00	.63	1.00	.70	1.00	.50	56,814
Isle Royale (F)	25	15.25	11.00	17.50	11.50	14.00	12.00	13.25	12.75	11.50	7.75	8.00	6.25	6.00	5.00	9.00	6.00	7.25	5.63	7.50	5.25	6.88	5.50	8.00	6.38	44,485
Mass Con (F)	25	16.75	15.00	18.00	14.00	13.50	9.25	11.25	9.50	9.75	7.00	7.50	5.63	6.50	3.00	6.50	4.75	5.50	5.00	5.00	4.13	5.00	4.00	4.50	4.00	65,717
Mayflower (F)	25	2.47	...	2.50	1.62	2.25	1.75	2.00	...	2.25	1.50	1.50	1.25	1.50	1.07	1.50	1.00	1.12	.75	1.00	.75	1.00	...	1.00	.50	15,634
Michigan (F)	25	10.50	9.00	11.50	9.50	10.50	9.25	10.50	8.00	9.00	6.00	9.25	7.25	9.00	5.75	9.00	6.50	8.88	6.50	7.25	6.00	7.00	6.00	7.00	4.50	29,087
Mohawk (F)	25	52.75	42.00	58.00	50.50	56.50	51.00	54.50	46.50	52.75	45.75	47.00	42.00	45.00	31.00	47.50	31.50	43.75	37.00	40.63	38.50	38.00	35.00	38.50	35.25	120,526
Mont. Coal & Coke (H)	25	7.63	4.50	7.50	6.00	8.00	6.75	7.50	6.50	7.00	6.00	5.00	...	5.00	4.50	5.00	3.50	4.00	3.50	...	...	4.00	2.00	3.75	3.00	41,115
Montreal & Boston (B)	5	2.88	1.75	2.25	1.63	1.75	1.50	2.38	1.50	2.00	1.50	1.94	1.25	1.25	.75	1.13	.70	1.00	.75	.88	.70	.75	.55	.85	.60	88,432
Napa Con. (C)	7	...	...	...	...	...	...	2.50	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	100
National (F)	25	1.13	...	1.25	...	...	...	1.13	1.00	1.00	.75	...	...	...	...	...	...	...	...	...	...	...	...	...	...	820
New Idria (C)	5	...	...	...	...	9.00	8.00	9.00	7.75	9.00	8.50	9.00	...	9.00	8.00	...	...	...	...	9.00	8.50	10.00	9.50	10.00	9.63	5,246
North Star (C)	10	...	...	...	...	9.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	100
Nova Sco'a St. & Ck. (J)	100	...	...	...	...	...	...	...	...	...	...	98.50	79.50	100.00	90.00	86.00	81.25	...	...	75.00	70.25	75.50	...	76.50	...	1,548
Old Colony (F)	25	2.38	1.25	2.50	1.75	2.25	1.63	1.50	...	2.00	1.25	1.00	.50	1.38	.75	1.75	1.00	1.00	.75	1.00	.50	2.00	.75	1.25	.75	20,106
Old Dominion (A)	25	19.88	16.50	23.50	19.50	21.00	18.00	18.88	17.00	18.38	16.00	15.50	12.75	13.75	8.88	13.50	10.00	10.75	6.00	14.00	5.00	12.00	3.75	11.25	7.13	119,849
Osceola (F)	25	66.50	59.00	79.00	61.00	74.00	68.00	71.75	64.00	68.50	59.00	60.00	50.00	57.00	43.00	64.00	49.50	61.00	50.00	63.00	51.00	58.50	51.00	62.00	56.50	83,419
Parrot (H)	10	28.25	26.00	34.00	26.50	33.00	28.50	30.25	25.75	28.88	23.00	24.00	19.75	22.00	16.00	25.00	17.00	21.50	17.50	19.63	16.00	19.25	17.50	23.00	17.25	59,512
Phoenix (F)	25	5.50	4.38	7.50	5.12	7.00	5.50	5.50	4.50	6.00	4.50	5.25	4.00	4.75	4.00	5.50	3.50	5.50	5.00	5.00	3.50	4.50	3.00	3.50	2.75	23,522
Quincy (F)	25	124.00	107.50	126.50	107.50	121.00	112.25	120.00	110.00	114.00	106.00	103.00	95.00	100.00	85.00	100.00	85.00	95.00	85.00	95.00	80.00	...	...	95.00	80.00	6,438
Rhode Island (F)	25	3.25	2.38	3.75	3.00	3.50	2.50	3.00	2.50	3.00	2.50	2.50	1.63	2.13	1.50	2.00	1.50	1.75	1.50	1.50	1.00	1.25	.75	1.50	.75	15,815
Santa Fe (I)	10	3.00	1.75	3.00	2.25	2.75	2.50	2.75	2.00	2.50	1.80	1.88	1.13	1.50	1.00	1.50	1.00	1.38	1.00	2.50	1.25	2.13	1.38	2.00	1.50	42,370
Shannon (A)	10	12.00	10.38	13.75	10.50	14.25	12.12	14.88	12.38	15.00	12.50	12.50	10.50	11.50	8.75	12.50	9.25	10.13	9.00	10.13	8.75	9.00	8.00	8.50	7.00	133,571
Tamarack (F)	25	155.00	149.00	189.50	105.00	186.00	157.00	165.00	140.00	145.00	110	120.00	110.00	117.00	76.00	119.00	75.00	113.00	81.00	109.00	75.00	97.00	80.00	100.50	81.00	15,239
Tecumseh (F)	25	1.50	1.00	1.80	1.00	1.25	1.00	1.00	...	.75	.50	...	...	.90	.40	.50	...	...	...	...	...	25.00	...	...	...	7,505
Tennessee (K)	25	27.50	17.25	30.75	25.50	33.00	31.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11,030
Tri-Mountain (F)	25	94.50	89.00	106.50	90.50	104.00	90.00	94.00	86.00	92.00	87.00	90.00	82.00	87.00	80.00	84.75	78.00	17.00	70.00	...	...	...	...	...	...	41,930
Trinity (C)	25	12.50	10.00	14.00	10.75	13.25	10.00	11.00	8.38	9.50	6.50	7.50	5.00	5.75	4.00	8.00	4.75	7.50	5.50	6.00	5.00	5.75	4.38	5.50	4.75	135,573
United common (H)	100	32.75	30.00	30.50	28.50	24.88	23.38	30.00	23.00	20.00	17.00	19.00	15.75	16.00	...	15.50	14.00	...	...	15.50	13.00	9.00	7.50	4.00	...	6,570
United States (L)	25	23.25	21.88	32.25	22.63	26.00	23.38	25.00	23.75	25.00	21.75	22.75	19.38	22.38	16.38	21.95	16.75	20.50	17.38	19.63	16.50	19.25	17.00	19.25	17.50	390,328
U. S. Coal & Oil (M)	25	15.25	13.50	15.88	13.50	16.25	14.38	15.00	13.50	14.75	12.25	13.00	10.63	12.00	9.63	12.38	9.13	11.13	9.00	10.25	9.00	9.50	8.25	9.00	8.00	127,457
Utah Con. (L)	5	29.88	24.00	32.75	28.25	31.00	28.00	29.13	23.88	33.63	28.50	30.88	28.00	29.38	22.00	28.50	23.00	28.00	23.50	29.50	24.00	28.00	26.25	31.00	26.75	400,247
Victoria (F)	25	7.00	6.13	9.00	6.75	8.00	6.50	6.75	5.63	6.25	4.75	5.00	4.00	4.38	3.00	4.25	3.75	4.00	3.00	3.50	2.44	3.00	2.50	2.88	1.50	52,925
Washington (F)	25	.25	.15	.25	...	.50	.35	.25	.15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2,240
Winona (F)	25	8.75	5.63	10.25	...	13.50	7.00	12.63	8.00	12.88	9.50	10.00	8.00	9.00	5.50	10.25	6.38	8.50	6.00	9.00	6.00	8.50	7.50	8.50	6.50	181,253
Wolverine (F)	25	71.00	64.00	71.00	67.00	77.00	70.50	75.00	70.00	72.75	66.00	70.00	64.50	68.00	54.00	74.00	62.00	73.75	62.50	70.00	62.75	67.00	64.00	69.50	60.00	28,794
Wyandot (F)	25	1.50	1.00	2.88	1.50	2.88	1.25	2.25	1.75	2.13	1.75	1.75	1.25	1.63	1.25	1.50	.75	1.25	1.00	1.25	.75	1.25	.75	1.25	.85	54,552

(A)—Arizona. (B)—British Columbia. (C)—California. (D)—Colorado. (E)—Mexico. (F)—Michigan. (G)—Missouri. (H)—Montana. (I)—New Mexico. (J)—Nova Scotia. (K)—Tennessee. (L)—Utah. (M)—West Virginia.

Total sales....6,977,873

*All mines are in Utah. Quotations are bids at the close on the first and third Saturdays in the month.

The Victoria is expected to become a producer during 1904, while the Old Colony is largely a land development company. Copper Range already has over $1,000,000 on hand. The company would have paid its first dividend this year had not the share capitalization been increased, to take over the Trimountain.

During 1903 the Calumet & Hecla paid $3,500,000, or $35 per share on the capitalization, Quincy $550,000, or $5.50 per share, and Wolverine $330,000, or $5.50 per share, a total of $4,380,000 from these three Lake Superior mines. This compares with $3,440,000 by the same mines in 1902. The Granby Consolidated paid one dividend, and the North Star Mines, of California, one of 50 cents. The Central Oil Company has sold its lands, although the company has not been finally liquidated. The Continental Zinc, Daly West and New Idria Quicksilver tremes. Quincy $126.50 and $85. Osceola $79 and $43.50, and Trimountain $106.50 and $70. The latter stock was converted into Copper Range, share for share, but there was no profit in the transaction, as Copper Range settled from $75 to $37 after the merger. Subsequently prices touched $69, but ranged close to $45 during the last two months of the year. Wolverine sold between $77 and $54, and has been strong throughout the year. Utah Consolidated has been a prime favorite, but the reason of the comparatively low selling price of the stock lies in the fact that the insiders, largely of Standard Oil interests, do not and cannot get all the stock they want. This company has made more favorable terms for selling its copper and its smelting plant has been enlarged. Atlantic has sold as low as $7.50, with but slight recovery. Bingham Consolidated has been disappointing, selling down close to from William A. Fitzgerald, of Towle & Fitzgerald. The United States Mining Company has practically wiped out its indebtedness during the year. There were some disappointments and delays at the smelter, but these troubles are believed to be over. The company has made money and will accumulate a surplus. The divorcing of the Dominion Coal and the Dominion Iron & Steel companies has occurred during the year. Both stocks suffered serious declines, and Canadian interests were pretty badly hurt. The coal company will now go back into the coal business on its own responsibility. The iron and steel company should never have assumed the lease.

It is surprising to note that out of 14 new mines at the Lake promoted in 1898 and 1899, but one has paid dividends, and that is Trimountain, which has since gone into Copper Range. The Champion,

owned between Copper Range and the St. Mary's Mineral Land, has also paid dividends. Lawson's Trinity has sold at from $14 to $4, and has yet to produce any copper. In another year the United States Coal & Oil Company will be out of the oil business by disposing of its oil lands, and devote its time to the production of coal.

Considerable criticism is heard of the narrow market in the Boston Stock Exchange. This criticism seems to be warranted, as some of its members, instead of developing business, often noted that they drove it away. This is due largely to the trading element which preys upon the broker with legitimate orders for business. Again, the incentive to make a good market is negatived by the acts of a certain large operator who seems determined to have the market to himself when possible. In other words, a great many people who would like to do business in speculate. The South African War has not yet been paid for, and the high taxes absorb much of the spare money that an Englishman usually has.

In spite of this dullness in speculation, and in the introduction of new propositions, plenty of attention has been given to the operations of mining companies; and, in fact, it has been a decided advantage that feverish speculation has given way to thoughtful consideration of legitimate mining. The opportunity has been afforded shareholders, directors and promoters to take an intelligent interest in actual mining, and to place the management of the companies and the mines on a sounder business basis.

The South African section has all year been under the cloud of scarcity of labor, and the present production is only two-thirds of what it was before the war. Many of the able-bodied natives are still living on the accumulations of the high wages paid to were acquired. Another crop of speculators, on whom they may unload, has not yet come forward, partly because of the lack of funds. The market, indeed, became so weak that the leading financial houses in London, Paris and Berlin have joined hands with Wernher, Beit & Co., with the object of steadying quotations and of buying up holdings, when offered in such a way as might cause a collapse of the market. In the meantime, it should be mentioned that the mining and metallurgical practice on the Rand is going steadily forward, and much good work is being done, under disadvantageous circumstances, in the way of reducing costs and increasing the general efficiency.

The West Australian market is the most notable example of the change from feverish speculation to business principles, that I mentioned above as one of the features of the year. The Whitaker Wright and

FLUCTUATIONS IN MINING SHARES IN LONDON IN 1903.

Name of Company and Country.	Shares Issued.	Par value.	Latest dividend paid in 1903.	Jan. 16. Buyers.	Jan. 16. Sellers.	April 18. Buyers.	April 18. Sellers.	July 16. Buyers.	July 16. Sellers.	Oct. 16. Buyers.	Oct. 16. Sellers.	Dec. 18. Buyers.	Dec. 18. Sellers.
		£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Alaska-Treadwell, Alaska, g.	200,000	5 0 0	1 6 Nov	4 7 6	4 12 6	4 7 6	4 12 6	4 12 6	4 17 6	4 2 6	4 7 6	4 10 0	4 15 0
Anaconda, Montana, c. s.	1,200,000	5 0 0	2 0 Nov	4 18 9	5 1 3	5 10 0	5 12 6	4 2 1	4 5 0	3 0 0	3 2 6	3 17 6	4 0 0
Camp Bird, Colorado, g.	820,000	1 0 0	9 Nov	1 10 6	1 11 6	1 15 0	1 15 6	1 6 1	1 8 2	1 3 9	1 6 3	1 6 3	1 8 9
Copiapo, Chile, c.	112,500	2 0 0	6 10 May	1 17 6	2 2 6	2 5 0	2 10 0	1 15 0	2 0 0	1 7 6	1 12 6	1 2 6	1 5 0
De Lamar, Idaho, g. s.	0 2 0 0	1 000'08	Oct	13 9	16 3	11 3	13 9	10 0	12 6	12 6	11 3	10 0	12 6
El Oro, Mexico, g. s.	1,080,000	1 0 0	9 Dec	1 5 6	1 7 6	1 11 3	1 13 9	1 13 9	1 16 3	1 6 3	1 8 9	1 5 0	1 7 6
Frontino & Bolivia, Colombia, g. s.	128,662	1 0 0	.....	17 6	1 0 0	17 6	1 0 0	15 0	17 6	8 9	11 3	6 3	8 9
Le Roi, British Columbia, g. s.	200,000	5 0 0	.....	1 7 6	1 10 0	1 8 9	1 11 3	1 2 6	1 5 0	8 9	11 3	13 9	16 3
Le Roi No. 2, Br. Columbia, g.	120,000	5 0 0	.....	17 6	1 0 0	17 6	1 0 0	1 1 3	1 2 9	15 0	17 6	18 9	1 1 3
Montana, Montana, g. s.	657,128	1 0 0	.....	2 0	2 6	2 3	2 9	1 9	2 3	1 6	2 0	9	1 3
Stratton's Independence, Colo., g.	1,000,000	1 0 0	6 Dec.	11 6	12 6	9 6	10 0	9 3	9 9	5 0	5 6	5 6	6 0
St. John del Rey, Brazil, g.	546,265	1 0 0	6 Dec.	15 0	16 0	16 6	17 6	*15 6	*16 3	15 0	18 0	14 0	15 0
Tomboy, Colorado, g.	300,000	1 0 0	June			1 17 6	2 2 6	1 10 0	1 15 0	1 7 6	1 10 0	1 12 6	1 17 6
Utah Consolidated, Utah, c. g.	300,000	1 0 0	6 3 July	4 15 0	5 5 0	5 10 0	6 0 0	5 10 0	6 0 0	4 15 0	5 5 0	5 15 0	6 0 0
Ymir, British Columbia, g.	200,000	1 0 0	.....	11 3	13 9	8 9	11 3	6 3	8 9	5 0	7 6	3 9	6 3
European:													
Linares, Spain, l.	15,000	3 0 0	1 0 Mar	2 5 0	2 15 0	3 15 0	4 5 0	2 0 0	2 10 0	2 0 0	2 10 0	2 10 0	3 10 0
Mason & Barry, Portugal, c.	185,172	1 0 0	11 0 May	3 7 6	3 12 6	3 17 6	4 2 6	3 10 0	3 15 0	3 7 6	3 12 6	3 7 6	3 12 6
Rio Tinto, Spain, c.	325,000	5 0 0	32 6 Nov	42 12 6	42 17 6	50 2 6	50 7 6	46 12 6	46 17 6	48 15 0	49 0 0	49 15 0	50 0 0
Rio Tinto pref., Spain, c.	325,000	5 0 0	2 6 Nov	6 0 0	6 5 0	6 0 0	6 5 0	6 0 0	6 5 0	6 0 0	6 5 0	6 0 0	6 5 0
Tharsis, Spain, c.	625,000	2 0 0	6 0 May	4 5 0	4 10 0	4 7 6	4 12 6	3 17 6	4 2 6	3 17 6	4 2 6	4 12 6	4 17 6
West Australian:													
Associated, g.	495,388	1 0 0	2 0 July	2 1 3	2 2 6	2 0 0	2 2 6	1 18 9	2 1 3	2 7 6	2 8 9	3 0 0	3 1 3
Cosmopolitan Proprietary, g.	400,000	1 0 0	1 0 May	18 3	18 9	17 6	18 0	*12 3	*12 9	14 6	15 6	15 0	15 6
Golden Horse Shoe, g.	300,000	5 0 0	6 0 Nov	10 15 0	10 17 6	10 7 6	11 0 0	8 12 6	8 17 6	8 0 0	8 2 6	8 16 3	8 18 9
Great Boulder Proprietary, g.	1,750,000	2 0	9 Dec	1 12 0	1 12 6	1 2 3	1 2 9	1 7 6	1 8 9	1 6 6	1 7 6	1 8 9	1 9 3
Great Fingall Consolidated, g.	250,000	1 0 0	6 0 Oct	7 11 3	7 13 9	7 11 3	7 13 9	7 15 0	7 17 0	8 18 9	9 1 3	8 12 6	8 15 0
Ivanhoe, g.	200,000	5 0 0	5 0 Oct	8 10 0	8 12 6	9 12 6	9 15 0	8 13 9	8 16 3	8 8 9	8 11 3	9 0 0	9 2 6
Kalgurli, g.	120,000	1 0 0	2 6 Oct	4 3 9	4 6 3	4 6 3	4 8 9	4 6 3	4 8 9	4 6 3	4 8 9	5 13 9	5 16 3
Lake View Consols, g.	250,000	1 0 0	.....	3 3 9	3 6 3	2 17 6	2 18 9	2 8 9	2 11 3	1 8 9	1 10 0	1 11 3	1 13 9
Miscellaneous:													
Briseis, Tasmania, t.	600,000	1 0 0	.....	10 6	11 6	7 6	8 6	5 9	6 3	4 6	5 0	5 9	6 3
Broken Hill Proprietary, N.S.W., s. l.	960,000	8 0	1 0 Aug	1 12 0	1 13 0	1 14 6	1 15 6	1 8 0	1 9 0	1 9 6	1 10 0	1 9 6	1 10 6
Mt. Lyell, Tasmania, c.	275,000	3 0 0	4 3 Sept	2 11 3	2 13 9	2 17 6	3 0 0	3 0 0	3 2 6	2 12 6	2 17 6	19 6	1 0 6
Mt. Morgan, Queensland, g.	1,000,000	1 0 0	3 Dec	4 2 6	4 7 6	4 0 0	4 5 0	*3 0 0	3 2 6	2 17 6	3 0 0	2 5 0	2 10 0
Waihi, New Zealand, g.	497,412	1 0 0	2 6 Dec	4 18 9	5 1 3	5 1 3	5 3 9	5 3 9	5 6 3	5 1 3	5 3 9	5 2 6	5 5 0
Indian:													
Champion Reef, g.	513,832	10 0	5 6 Aug	6 11 3	6 13 9	7 7 6	7 10 0	7 6 3	7 8 9	7 11 3	7 13 9	8 3 9	8 6 3
Mysore, g.	566,043	10 0	4 0 Nov	6 18 9	7 1 3	7 1 3	7 3 9	7 0 0	7 2 6	6 15 0	6 17 6	6 12 6	6 15 0
Nundydroog, g.	484,000	10 0	1 5 Nov	1 18 9	2 1 3	2 6 3	2 8 9	2 10 0	2 12 6	2 6 3	2 8 9	2 3 9	2 6 3
Ooregum, g.	343,000	10 0	9 Dec	1 11 3	1 13 9	1 15 0	1 17 6	1 11 3	1 13 9	1 10 0	1 12 6	1 2 6	1 5 0
Ooregum, pref., g.	240,000	10 0	9 Dec	2 0 0	2 2 6	2 5 0	2 7 6	1 18 9	2 1 3	1 18 9	2 1 3	1 12 6	1 15 0
South African:													
Angelo, g.	600,000	1 0 0	6 0 Aug	7 12 6	7 17 6	7 3 9	7 6 3	7 0 0	7 2 6	6 7 6	6 12 6	6 16 3	6 18 9
Bonanza, g.	200,000	1 0 0	10 0 Aug	3 10 0	3 11 3	4 0 6	4 2 6	4 2 6	4 5 6	2 6 3	2 8 9	2 2 6	2 5 0
British South Africa.	4,436,019	1 0 0	.....	3 8 9	3 11 3	3 1 3	3 3 9	2 13 9	2 16 3	2 6 3	2 7 6	2 7 6	2 8 9
Cape Copper, c.	300,000	2 0 0	1 0 July	2 12 6	2 17 6	2 17 6	3 0 0	2 10 0	2 12 6	2 17 6	3 0 0	3 2 6	3 5 0
Cape Copper, pf., c.	75,000	2 0 0	1 0 July	3 2 6	3 7 6	2 18 9	3 1 3	2 10 0	2 15 0	2 15 0	3 0 0	3 0 0	3 5 0
City & Suburban, g.	340,000	4 0 0	4 0 Aug	6 12 6	6 15 0	6 7 6	6 12 6	6 6 12	6 6 15	5 15 0	6 0 0	6 15 0	7 0 0
Crown Reef, g.	120,000	1 0 0	20 0 Oct	17 10 0	18 0 0	17 10 0	18 10 0	16 15 0	17 5 0	17 10 0	18 0 0	17 0 0	17 10 0
De Beers Con., d.	800,000	2 10 0	10 0 Aug	19 11 3	19 13 9	19 8 9	19 11 3	19 6 3	19 8 9	18 18 9	19 1 3	19 3 9	19 6 3
De Beers Con., deferred, d.	1,000,000	2 10 0	15 0 Aug	22 5 0	22 7 6	22 0 0	22 2 6	19 13 9	19 18 9	19 11 3	19 13 9	20 6 3	20 8 9
East Rand Proprietary, g.	990,000	1 0 0	5 0 Aug	8 11 3	8 13 9	8 3 9	8 5 0	7 7 6	7 8 9	7 1 3	7 3 9	7 3 9	7 6 3
Ferreira, g.	90,000	1 0 0	15 0 Aug	24 0 0	25 0 0	22 5 0	22 15 0	20 15 0	21 5 0	19 10 0	20 0 0	19 10 0	20 0 0
Geldenhuis Estate, g.	200,000	1 0 0	6 0 Aug	7 0 0	7 2 6	6 13 9	6 16 3	6 8 9	6 10 0	6 5 0	6 7 6	6 5 0	6 7 6
Geduld, g.	400,000	1 0 0	.....	7 12 6	7 15 0	7 16 3	7 18 9	6 11 3	6 16 3	6 3 9	6 6 3	6 11 3	6 13 9
Henry Nourse, g.	125,000	1 0 0	10 0 Aug	9 12 6	9 17 6	9 5 0	9 10 0	9 2 6	9 7 6	7 15 0	8 0 0	8 17 6	9 2 6
Jubilee, g.	50,000	1 0 0	5 0 July	6 0 0	6 10 0	5 5 0	5 10 0	5 0 0	5 5 0	5 0 0	5 5 0	4 17 6	5 2 6
Jumpers, g.	100,000	1 0 0	.....	4 5 0	4 10 0	3 17 6	4 2 6	3 10 0	3 15 0	3 0 0	3 5 0	3 7 6	3 12 6
Langlaagte Estate, g.	470,000	1 0 0	3 0 Aug	4 6 3	4 8 9	4 2 6	4 5 0	3 18 3	4 1 1	3 11 3	3 13 9	3 16 3	3 18 9
May Consolidated, g.	288,750	1 0 0	3 0 Aug	4 13 9	4 16 3	4 10 0	4 12 6	4 2 6	4 5 0	3 18 9	4 1 3	4 2 6	4 5 0
Meyer & Charlton, g.	100,000	1 0 0	5 0 Dec	6 0 0	6 5 0	5 10 0	5 12 6	4 7 6	4 12 6	5 0 0	5 5 0	5 15 0	6 0 0
Modderfontein, g.	200,000	1 0 0	.....	11 2 6	11 5 0	11 2 6	11 5 0	9 16 3	9 18 9	8 10 0	8 12 6	9 0 0	9 2 6
Namaqua, c.	94,331	2 0 0	3 0 Dec	27 17 6	3 2 6	3 7 6	3 10 0	2 17 6	3 0 0	3 2 6	3 7 6	3 5 0	3 10 0
New Jagersfontein, d.	200,000	5 0 0	10 0 Dec.	27 2 6	27 7 6	28 2 6	28 7 6	28 17 6	29 2 6	28 12 6	28 17 6	*28 7 6	28 12 6
New Primrose, g.	325,000	1 0 0	2 0 Aug	4 3 9	4 6 3	3 17 6	4 0 0	2 16 3	2 18 9	3 11 3	3 12 6	3 15 0	3 17 6
Rand Mines, g.	1,795,956	5 0	.....	11 7 6	11 10 0	11 0 0	11 2 6	10 2 6	10 3 9	9 8 9	9 10 0	9 16 3	9 18 9
Robinson, g.	750,000	5 0 0	5 6 Dec.	11 2 6	11 7 6	10 13 9	10 16 3	10 8 3	10 11 1	10 0 0	10 5 0	10 1 3	10 3 9
Robinson Deep, g.	950,000	1 0 0	2 0 Aug	5 11 3	5 13 9	5 6 3	5 8 9	4 15 0	4 17 6	5 1 3	5 3 9	5 12 6	5 15 0
Rose Deep, g.	425,000	1 0 0	2 0 Aug			9 2 6	9 7 6	8 12 6	8 17 1	7 17 6	8 2 6	8 7 6	8 12 6
Salisbury, g.	100,000	1 0 0	.....	2 17 6	3 0 0	2 12 6	2 15 0	2 7 1	2 17 6	1 12 6	1 17 6	1 15 0	2 0 0
Sheba, g.	1,075,000	1 0 0	.....	1 6 3	1 7 6	1 2 6	1 5 0	17 6	1 8 3	12 6	13 9	10 0	13 9
Village Main Reef, g.	400,000	1 0 0	4 0 June	8 17 6	9 2 6	8 8 17	6 9 0	0 8 0	0 8 2	6 7 7	6 7 12	7 12 6	7 17 6
Wemmer, g.	80,000	1 0 0	10 0 July	13 10 0	14 0 0	12 15 0	13 0 0	11 10 0	12 0 0	9 10 10	10 0 0	11 0 0	11 10 0

c—Copper. d—Diamonds. g—Gold. l—Lead. s—Silver. t—Tin. *Ex-dividend.

copper shares refrain. This does not add to the prestige of Boston or of copper mining shares.

THE LONDON MINING MARKET.

BY OUR SPECIAL CORRESPONDENT.

The London mining market has been in very low water all the year. There has been practically no speculation on the Stock Exchange in any section of the market. The cause for this dullness is due, to some extent, to the disinclination of the public to touch mining propositions after their eyes have been opened by the Whitaker Wright revelations, but more to the absence of surplus funds with which to them by the military authorities, and others find more congenial employment on railroads, or elsewhere, so that it is difficult to obtain as many for the mines as formerly. Those who have made special inquiries find that, in any case, the black population is not as great as has been supposed. The majority of the mine operators are now taking steps toward obtaining unskilled labor from India or China, but the solution of the labor trouble is still far off. Under these conditions, it is only natural that the market for South African shares should be stagnant and weak. Those who bought for a rise on the termination of the war are still unable to realize; and, in fact, their holdings are worth much less than when they Bottomley influences have been shaken out, while the Kaufman group has been steadied, and their mines are placed on an economic basis. A large number of mines have come into the management of the firm of Bewick, Moreing & Co., who have effected great reforms in administration, and have suppressed, to a large extent, the secret speculations of employees in the mines and offices. Among the mines that are now in excellent condition are Horseshoe Perseverance, Ivanhoe, Great Boulder, Oroya Brownhill and Great Fingall. On the other hand, Lake View Consols have not yet recovered from the gutting process that took place under the Whitaker Wright régime. Heroic efforts have been

made by the shareholders of the Associated Northern Blocks to rescue this mine from the Landau control, and at one time it seemed probable that the management would be placed in the hands of Bewick, Moreing & Co., and that Mr. J. H. Curle would go on the board. The movement eventually resolved itself into a personal quarrel between Mr. Landau and the other directors, so that at the time of writing no reforms have been effected. Another interesting development in the market is that the deep leads at Moorlort, Victoria, floated three years ago by the Whitaker Wright group, have been taken over by a new company, and the management placed in the hands of Bewick, Moreing & Co.

Some attempt was made early in the year to bring the Arltunga district, in the northern part of South Australia, before the notice of the public, and possibly, if the speculative market had had any money for such things, there might have been an Arltunga boom. As it was, however, the public interest in the district died out in a few weeks. The Smelting & Refining Company of Australia has been full of work all year and profits have been earned. An important contract was entered into with a French company owning properties in New Caledonia for the smelting of their nickel ores at the Smelting & Refining Company's works. The company also announced that a syndicate of English and American capitalists were prepared to take over the management and guarantee dividend, but it is more probable that this syndicate will take over the company altogether. The management of the company and its relations with this syndicate are as mysterious as ever. The long talked-of amalgamation of the Mount Lyell Mining & Railway Company with the North Mount Lyell Company was effected during the summer. The former company's deposits are being gradually exhausted, but the smelting plant is in excellent condition, while the latter company owns valuable deposits, but could not smelt its ores, so that the amalgamation was for the benefit of all parties concerned. In October the Tasmania Gold Mining Company was floated by John Taylor & Sons, to acquire mines belonging to a local company of similar name that have been worked successfully for many years. The water difficulty had prevented the local owners from making a profit recently, but the new capital now introduced will, it is expected, restore prosperity. The above are the main features of the London mining market connected with Australian mining.

The Indian mines have well maintained their reputation as regular producers during the past year. The Mysore and the Champion Reef mines have acquired additional adjoining properties, which are expected to contain their deep levels. This step was desirable, as it was estimated that the veins would pass out of their vertical boundaries in the course of a few years.

Attention has been turned to Egypt as a mining center, and John Taylor & Sons and the Nile Valley Company are doing good work there. The latter company obtained the financial assistance of Mr. J. B. Robinson, of Rand fame, and is well provided with working capital. It is not possible to make an Egyptian boom on the Stock Exchange, as the terms of the concessions from the Egyptian Government are stringent, and all propositions are scrutinized severely.

Russia and Siberia have also had some attention devoted to them. A copper proposition, called the Caucasus Copper Company, is being worked privately, and another, in the Kirghiz steppes, is being developed by the Siberian syndicate. The Hooley Company, called, after its reconstruction, the Nerchinsk Gold Company, is still in operation, but it was found that the gravel mines originally acquired were worthless, and attention has been turned to some quartz mines which appear to be promising.

Among American mines controlled in London, El Oro, Tomboy and Camp Bird continue to occupy a foremost place. At the first-named, considerable development work has been done, and the crushing plant extended in order to make it possible to treat large quantities of lower grade ore, the additional expense involved being provided for entirely out of revenue. The Tyee copper mine, on Vancouver island, has developed well, and now gives promise of handsome returns to the English shareholders. The Palmarejo mine, in Mexico, under Mr. Oxnam's management, has been established on an excellent footing, after having been a source of great loss to English shareholders for a long series of years. Under Mr. Oxnam's guidance, a large amount of exploratory work on other lands belonging to the Palmarejo company is being done. The Mountain Copper Company, in Shasta county, California, has suffered from strikes, so that the profits have been curtailed. Stratton's Independence continues to ship ore and make profits, but its future is very uncertain. With these exceptions, American mines are not doing very well for English shareholders at present. The Rossland mines are still struggling, and their real value has not yet been proved. The Hall Mining & Smelting Company continues in a bad way, both as regards its mines and its custom ores. The Ymir mine continues in low-grade ore, and it has been necessary to provide new capital for developments. The Mikado mine, in the Lake of the Woods district, has been obliged to ask for more capital. The Montana Mining, the Sierra Buttes, and the De Lamar Mining companies are still working, but their ores are practically exhausted. The American properties controlled by Mr. Frank Gardner have been particularly unfortunate, for the Copper King, of Fresno county, Cal., has had to go into a receiver's hands, on account of the erratic behavior of the manager; while the Avino Mines of Mexico have had to be reconstructed to provide money for a different system of metallurgical treatment. Other Mexican properties owned in England have also suffered from metallurgical difficulties, notably the Parral; while a new flotation, the San Francisco del Oro, starts out with this drawback, the ore being far too refractory for any hitherto known system of treatment. The Playa de Oro, of Ecuador, an American corporation, which introduced its shares in England some years ago, has been turned into an English company, at the request of shareholders here. The funds were exhausted, not for the first time, and before any more was subscribed the control had to be brought to London. The value of the property, however, has still to be proved. The control of the Utah Consolidated, which has been proved to be a valuable copper property, was bought up by the American copper ring, the English company wound up, and the ownership transferred to an American company. The other company in the same offices, the Boston Consolidated, still remains in England. Mr. Ralph Nichols reported favorably on it, stating that large bodies of low-grade ore exist, which can be treated profitably on a large scale, but advised that more development work should be undertaken before launching out into great expenditure on smelters. Subsequently it has been found possible to sell the ore to custom smelters, so that it will not be necessary for the company to erect its own smelter.

DIVIDENDS AND ASSESSMENTS IN 1903.

By CHARLES C. SCHNATTERBECK.

Briefly, 161 public corporations operating mines and metallurgical works in the United States—among them a number whose shares are principally owned abroad—paid in dividends, in 1903, the large sum of $139,440,971. This division of profits would doubtless have been larger but for labor troubles and a change in the dividend policy of several important combinations, since fully 78 per cent of the dividends reported have been declared by the big consolidations. Thus the United States Steel Corporation, one of the largest dividend payers in the world, which declares 7 per cent annually on its preferred shares, and for two years paid dividends of 4 per cent on the common par, cut the latter to 2 per cent. and in December passed it. Again, the Crucible Steel Company and the Republic Iron & Steel Company, both with a preferred capital of $25,000,000, have passed the last quarterly dividend of 1.75 per cent and have returned, so far, only 21 and 28 per cent, respectively. It is also noteworthy that the Standard Oil Company, the second largest dividend payer in existence, has cut its annual rate to 44 per cent, the smallest in five years.

The total dividends paid by the 65 industrial companies reporting amounted to $107,770,971, or $15,321,029 less than 1902, the falling off being chiefly from certain large iron and steel concerns. The distribution was as follows: Fourteen coal and coke companies paying as high as 10 per cent per annum, $5,509,000; 18 iron and steel, usually 7 per cent on their preferred stock, and infrequently from 2 to 4 per cent on the common, $51,700,971; 24 petroleum and natural gas, from 4 to 44 per cent, $45,786,000, and nine chemical and mineral, from 5 to 12 per cent, $4,775,000.

The metal mines have been favored by higher market prices. In all 96 declared dividends of $31,670,000, which is $3,818,000 more than was reported in 1902—an amount almost equal to the deficit shown by the industrial concerns. As usual, the copper mines hold first place, the 17 reporting having paid $15,989,000. The Calumet & Hecla, of Michigan, has declared dividends of 140 per cent on its par value of $25, and since its incorporation in 1871, has returned its $2,500,000 capitalization more than 33 times. There are several new payers in the copper list this year, among them being the Tennessee, incorporated in 1899, the shares of which have been put on a 10 per cent annual basis. There were 72 gold, silver and lead properties that have declared dividends aggregating $14,712,000, somewhat better than a year ago, and partly explained by the "extra" payments of the Alaska-Treadwell, Alaska-Mexican, Daly-West and Silver King, of Utah, and Camp Bird, of Ouray, Colo. The smelter trust, the American Smelting and Refining Company, continues to pay 7 per cent on its preferred stock, and in December put the common on a 5 per cent basis. The Colorado mill combination, the United States Reduction and Refining Company, owing chiefly to labor troubles, passed the 1 per cent quarterly dividend on the common stock in October, and the 1.50 per cent on the preferred in December. Three California quicksilver mines, one of which—New Idria, paid 24 per cent per annum—reported $182,000, showing an improvement over last year. Four zinc properties declared $787,000, and were led by the New Jersey Zinc Company, which pays 7 per cent per annum.

In addition to the above there were 27 Mexican and metallurgical companies that reported dividends of $3,585,400 gold; four Canadian, $815,000, and four Central and South American, $480,000; a total of $4,880,400. This, added to the payments made by properties in the United States, makes a grand total of $144,321,371 by 106 companies.

There have also been many private and close corporations with few stockholders that have distributed substantial profits during the past year. It is roughly estimated that these dividends amounted to something like one-third or one-quarter of the total reported by public concerns. Another source of good revenue to investors is the stock held in the various metal-selling companies, notably copper, which are understood to yield handsomely.

Assessments levied by 200 companies for developing and equipping mines and works in the United States amounted to $2,878,800. These assessments were called principally by silver mines in Nevada and gold properties in Utah, and were mostly paid in small instalments. Compared with 1902 the total amount shows an increase of $216,904, but the number of companies is less by 24. There have also been calls on capital stock, especially by Michigan copper companies with a par value of $25, which are not considered regular assessments. They are really payments of installments on subscriptions, only a part of the par value having been paid on the original allotment.

DIVIDENDS ($1—$1,000.)

Name of company.	1901.	1902.	1903.	Grand Total.
Aberdeen, N. M., c.	$32	....	....	$32,175
Acacia, Colo., g.	....	....	$14	57,560
Adams, Colo., s. l.	15	$23	....	738,500
Alabama Con., Ala., pf.	172	172	172	689,680
Alabama & Georgia, pf., l.	....	....	7	6,500
Alaska, B. C., g.	135	135	....	395,000
Alaska-Mexican, Alaska, g.	....	....	108	573,381
Alaska-Treadwell, Alaska, g.	300	300	450	5,275,000
Allis-Chalmers, pf.	569	1,138	1,138	2,863,750
Alma, Cal., oil.	....	....	46	45,600
Amalgamated, Mont, c.	8,304	3,847	3,078	22,734,407
Am. Agric. Chem., pf.	1,025	1,028	1,088	4,670,760
Am. Cement, Pa.	80	160	160	540,000
Am. Coal, Md.	150	150	150	1,432,500
Am. Iron & Steel, Pa., com.	19	10	....	256,100
Am. Iron & Steel, Pa., pf.	150	150	150	600,000
Am. Sm. & Ref., pf.	2,709	3,500	3,500	12,391,553
Am. Steel Foundries, pf.	....	233	930	1,162,500
Anaconda, Mont., c.	3,900	1,200	1,200	23,250,000
Annie Laurie, Utah, g. s.	....	60	225	285,000
Arizona, Ariz., c.	866	1,115	1,003	4,448,596
Arrow, Colo. g.	50	....	....	50,000
Atlantic, Mich, c.	80	....	....	940,000
Aztec, Cal., Oil.	12	16	14	43,050
Bald Butte, Mont, g.	180	160	15	1,312,148
Barreno, Mex., g. s.	....	....	14	67,954
Bartolome de Medino, Mex.	....	20	17	79,728
Big Six, Colo., s. l.	....	....	3	17,500
Boston & Colo. Sm., Colo.	45	45	....	402,350
Boston-Little Circle, Mo., z.	25	....	....	112,500
Boston & Montana, Mont.	5,250	900	1,200	28,325,000
Boston Smelting, Colo., g. c.	100	....	....	150,000
Bosun, B. C., s. l.	13	....	....	12,500
Breece, Colo., s. l. l.	70	20	10	200,000
Buena Vista, Mex., g. s.	....	....	5	5,000
Buffalo Hump, Idaho, g.	25	....	....	325,000
Bunker Hill & Sullivan, Idaho, s. l.	252	138	96	1,520,000
Butler-Liberal, Utah, g. s.	....	....	3	2,500
Butte & Boston, Mont.	600	....	....	1,600,000
Butterfly-Terrible, Colo. g.	31	....	....	31,250
Butter'a, Salvador, g.	....	....	252	252,000
California, Cal., g.	43	....	....	43,200
California, Cal., oil, gas.	540	....	....	540,000
Calumet & Arizona, Ariz., c	....	....	400	400,000
Calumet & Hecla, Mich., c.	4,500	2,500	3,500	83,350,000
Cambria Steel, Pa.	2,150	1,350	1,350	6,450,000
Camp Bird, Colo., g.	....	125	843	967,704
Cariboo-McKinney, B. C., g	....	19	....	496,837
Carisa, Utah, g. s. c.	30	....	....	30,000
Carmen (Hidalgo), Mex.	....	....	9	78,616
Carmen-Guanajuato, Mex.	....	....	18	27,750
Cashier, Colo., g. s.	....	....	18	18,000
Centennial-Eureka, Utah.	200	50	....	2,667,700
Central, Cal., oil.	63	24	....	160,247
Center Creek, Mo., l.	30	20	10	110,000
Center Star, B. C.	175	....	....	210,000
Central Coal & Coke, Mo., common	....	86	308	551,250
Central Coal & Coke, Mo., pf	....	84	94	796,872
Central Eureka, Cal., g.	16	8	96	119,334
Central, Mo., l.	60	60	60	385,000
Central, W. Va., oil.	25	55	30	152,500
Central Point Con., Cal., oil	38	....	....	45,600
Century, Utah, g. s. l.	....	....	9	9,000
Champion, Mich. c.	....	....	100	100,000
Cherry Hill, Cal., g.	23	30	....	62,500
Chicago, Cal., oil.	....	10	....	10,000
Chippewa Con., Colo.	....	3	....	2,500
Cinco Senores, Mex., s. g.	9	57	57	711,935
C. K. & N., Colo., g.	....	14	72	85,914
Clinton, Colo., g. s.	....	....	36	60,000
Colorado City, Colo., g. s.	....	65	....	65,000
Colorado Fuel & Iron, Colo., common.	682	805	....	1,642,500
Colorado Fuel & Iron, Colo., preferred.	160	160	80	1,560,000
Colorado Specie Payment, Colo., g.	27	14	....	40,500
Columbus & Hocking, Colo., coal, l.	....	....	52	86,531
Consolidated Coal, Ill.	50	50	50	150,000
Consolidated, Colo., g.	182	76	....	378,000
Con. Mercur (New), Utah, g.	375	395	150	1,030,000
Consolidation Coal, Md.	205	205	205	6,536,650
Continental, Cal., oil.	10	....	....	10,400
Continental, Mo., z.	....	18	35	52,800
Copiapo, Chile, c.	108	....	40	2,865,900
Cripple Creek, Colo., pf., g.	....	5	....	45,000
Croesus, Cal., g.	76	....	....	227,300
Crucible Steel, pf.	1,740	2,187	1,312	5,250,000
Cummings Cement, N. Y.	27	27	27	216,000
Dabney, Cal., oil.	10	120	16	145,000
Dalton & Lark, Utah.	263	....	....	350,000
Daly West, Utah, s. l. g. c.	600	864	1,334	3,597,000
Deadwood-Standard, S. D., preferred	....	....	6	6,000
De Lamar, Idaho, s. g.	192	122	32	2,740,340
Dixie, Utah, g.	158	....	....	167,500
Doctor-Jack Pot, Colo., g.	232	....	....	232,000
Doe Run, Mo., l.	60	60	90	627,072
Dolores, Mex., g. s.	....	....	25	25,000
Dominion Coal, N. S.	240	120	....	2,040,000
Dominion Iron & Steel, N. S., preferred.	175	350	....	525,000
Dos Estrellas, Mex., g. s.	....	....	359	582,823
Elkton Con., Colo., g.	325	100	....	1,404,461
El Oro, Mex., g.	24	....	22	55,300
El Paso, Colo., g.	946	564	1,004	2,514,400
Empire Con., Cal., q.	....	15	....	15,000
Empire-State-Idaho, Idaho.	586	304	227	1,738,604
Empire Steel & Iron, pf.	71	71	73	367,350
Esperanza, Mex., g. s.	171	159	84	1,154,199
Feather River Expl., Cal., g.	20	....	....	20,000
Federal Mg. & Sm., pf.	....	....	184	183,750
Finance, Colo., g.	....	2	....	2,000
Four Metals, Colo., g. s. l. c.	25	....	....	25,000
Four, Cal., oil.	8	19	27	56,362
Fraternal, Mex., s.	....	....	22	51,263
Free Coinage, Colo., g.	120	40	....	160,000
Frontino & Bolivia, Columbia, c.	103	....	....	1,211,703
Garfield Con., Colo., g.	125	....	....	159,000
Gemini, Utah, g.	....	150	200	1,050,000
General Chemical, com.	287	296	371	1,300,537
General Chemical, pf.	506	565	591	2,566,418
George's Creek Coal & Iron, Md., preferred.	....	....	33	33,000
Giant, Cal., oil.	....	....	5	5,000
Globe, Cal., oil.	....	....	3	3,000
Gold Coin (Victor) Col., g.	360	260	10	1,230,000
Gold King, Colo., g.	56	....	47	459,056
Gold Hill Bonanza, Colo., g	....	15	...	15,000
Golden Cycle, Colo., g.	....	56	293	348,750
Golden Eagle, Colo., g.	10	....	....	98,916
Goodenough, B. C., s. l.	....	7	....	13,188
Granby Con., B. C.	....	....	134	133,630
Grand Central, Utah, g.	....	....	225	916,250
Gray Eagle, Cal., oil.	97	....	....	217,000
Greene Con., Mex., c.	220	....	432	651,820
Guadalupana, Mex., g. s.	....	....	7	69,930
Guadalupe Mill, Mex.	157	123	31	3,515,750
Gwin, Cal., g.	120	105	....	426,500
Hanford, Cal., oil.	6	7	....	13,000
Hecla, Idaho, s. l.	....	....	20	120,000
Hecla Con., Mont., s. l.	30	....	....	2,250,000
Heywood, Tex., oil.	32	....	....	32,000
Higgins, Tex., oil.	....	97	....	96,850
Home, Cal., oil.	160	90	43	492,500
Homestake, S. D., g.	1,260	1,058	655	12,367,750
Homestake, Cal., oil.	12	1	....	33,000
Horn Silver, Utah, s. l. c.	72	....	20	5,362,000
Horseshoe, S. D., g.	....	70	....	70,000
Houston, Tex., pf., oil.	224	448	224	896,500
Imperial, Cal., oil.	20	24	240	500,000
Independence Con., Colo., g.	181	....	....	281,375
Ingham Con., Colo., g.	34	....	....	33,981
International Acheson Graphite, preferred.	35	35	35	105,000
International Nickel, pf.	....	....	350	349,660
Iowa, Colo., g. s. l.	67	67	67	336,837
Iron Silver, Colo., s. l.	....	....	200	2,850,000
Isabella, Colo., g.	23	....	....	742,500
Jamison, Cal., g.	12	....	47	120,900
Jefferson & Clearf. Coal, Pa., common.	....	75	75	180,000
Jefferson & Clearf. Coal, Pa., preferred.	75	75	75	600,000
Katinka, Colo., g.	10	....	....	10,000
Kendall, Mont., g.	....	....	230	305,000
Kendrick & Gelder Sm., Colo	20	....	....	20,000
Kennedy, Cal., g.	10	....	....	1,801,000
Kern, Cal., oil.	25	20	....	370,000
La Fortuna, Ariz., g.	150	162	....	1,238,500
Last Dollar, Colo., g.	60	....	30	210,000
Lehigh Coal & Nav., Pa.	861	717	574	20,668,986
Le Roi, No. 2, B. C., g.	144	144	....	288,000
Liberty Bell, Colo., g.	....	....	78	91,233
Lightner, Cal., g.	18	5	15	48,669
Magnolia, Colo., g.	....	11	....	197,000
Mammoth, Utah, g. s. c.	100	....	....	1,860,000
Maryland Coal, Md., pf.	104	141	160	1,046,135
Mary McKinney, Colo., g.	150	120	90	560,000
May Day, Utah, g. s. l.	18	12	....	30,000
Mesquital, Mex., g. s.	36	....	15	51,458
Metallurgical Co. of Torreon, Mex.	....	....	270	269,500
Midget, Colo., g.	15	30	....	195,000
Milwaukee, Idaho, g.	....	....	20	20,000
Mine La Motte, Mo., l.	....	....	240	240,000
Mines Co. of America.	....	....	455	455,000
Modoc, Colo., g.	35	25	10	260,000
Monongahela River Coal & Coke, Pa., pf.	694	1,380	694	3,124,345
Mont. Ore Purchasing.	722	324	648	3,294,000
Montana-Tonopah, Nev., g.s.	....	....	43	42,750
Mountain, Cal., c.	720	540	143	3,776,250
Napa Con., Cal., q.	40	40	40	1,220,000
National Carbon, pf.	315	315	315	1,575,000
National Lead, pf.	1,043	1,043	1,043	13,972,168
Natividad, Mex., s. g.	24	48	109	272,463
New Idria, Cal., q.	70	80	120	520,000
New Jersey, z.	400	1,600	700	5,500,000
New Leadville Home, Colo.	137	25	...	265,500
New Zealand Con., Colo., g	46	32	....	76,950
North Star, Cal., g.	....	47	125	706,356
North Star, B. C., g.	....	78	....	331,500
Nova Scotia Steel & Coal, common	....	268	247	515,000
Nova Scotia Steel & Coal, pf.	42	82	82	206,000
N. Y. & Honduras Rosaria	240	100	15	1,785,000
Nugget, Colo., g.	30	....	....	84,730
Ohio. & Ind. Nat. Gas.	360	360	360	1,440,000
Old Colony, Mo., z.	70	....	....	138,184
Ontario, Utah, s.	90	180	....	14,917,000
Osceola, Mich., c.	575	....	....	4,247,300
Pacific Coast Borax, Cal.	200	228	228	1,445,500
Parrot, Mont., c. s.	1,264	115	....	5,775,925
Payne, B. C., g.	78	....	....	1,438,000
Peerless, Cal., oil.	....	47	144	190,400
Pennsylvania Coal, Pa.	2,160	....	....	21,860,000
Pennsylvania Con. Cal., g.	....	....	25	187,075
Pennsylvania Salt.	300	300	300	13,450,000
Pennsylvania Steel.	1,151	1,177	1,177	3,505,750
Penoles, Mex., s. l.	693	1,128	510	2,488,114
Petroleum Dev., Cal.	....	25	....	25,000
Philadelphia Nat. Gas, com	848	905	926	3,416,831
Philadelphia Nat. Gas, pf.	200	400	200	1,000,067
Pioneer (Nome), Alaska.	....	300	....	300,000
Pittsburg, Cal., oil.	....	....	48	48,000
Pittsburg Coal, Pa., pf.	2,079	2,079	2,079	8,316,336
Plumas-Eureka, Cal., g.	34	....	....	2,831,294
Pocahontas, Pa., pf., coal.	....	....	90	90,000
Pointer, Colo., g.	25	....	....	25,000
Portland, Colo., g.	720	270	360	4,657,080
Pride of the West, Ariz., g	....	15	....	15,000
Providence, B. C., g.	....	....	2	2,224
Providencia, Mex., s. g.	16	60	9	169,740
Quicksilver, Cal., pf.	22	22	22	1,931,411
Quincy, Mich., c.	900	700	550	14,120,000
Quincy, Utah, g. s. l.	725	234	....	959,375
Rambler-Cariboo, B. C., g.	25	150	....	250,000
Real del Monte, Mex., g. s	....	....	54	2,926,884
Red Bird, Mont., g. s. l. c.	....	....	36	36,000
Reed, Cal., oil.	50	50	400	500,000
Republic Iron & Steel, pf.	1,423	1,423	1,429	6,053,476
Rob Roy, Mo., z.	....	1	2	2,253
Rocco-Homestake, Nev.	45	22	....	76,500
Sacramento, Utah, g. s. l.	15	....	60	193,000
San Carlos, Mex., s. g.	212	22	....	234,329
San Diego de Char, Mex.	32	....	....	61,100
San Francisco Mill, Mex.	37	61	....	287,160
San Joaquin, Cal., oil.	25	35	25	185,000
San Rafael, Mex., s. g.	136	54	201	1,975,220
Senator, Cal., oil.	5	....	4	9,045
Shawmut, W. Va., oil.	100	50	53	203,000
Shelby, Ala., l.	120	160	150	840,000
Silver Hill, Nev., g. s.	....	5	18	28,800
Silver King, Utah, s. l.	1,300	1,300	1,300	7,350,000
Silver Shield, Utah, g. s. l.	3	....	....	4,500
Sloss-Sheffield Steel & Iron, preferred	456	456	456	1,710,000
Smuggler, Colo., s. l. z.	360	20	....	2,175,000
Soledad, Mex., g. s.	....	25	42	264,712
Sorpressa, Mex., g. s.	27	....	14	200,066
South Godiva, Utah, g. s.	2	....	....	2,000
So. Cal. Oil & Fuel, Cal.	33	....	....	39,000
South Winnie, Colo., g. s.	15	....	....	15,000
Spearfish, S. D., pf., g.	....	18	80	97,020
Specie Payment, Colo., g.	....	2	....	8,000
Standard, Ariz., c.	....	....	40	40,000
Standard Con., Cal., g.	71	71	71	4,178,170
Standard, Idaho, s. l.	300	150	225	2,945,000
Standard Oil of N. J.	46,660	43,650	42,680	200,715,000
Sta. Gertrudis, Mex., g. s.	81	88	117	2,764,688
Sta. Maria de Gaud., Mex.	133	85	....	377,918
Sta. Maria de la Paz, Mex.	....	104	130	1,977,953
St. Joseph, Mo., l.	150	150	225	3,834,500
Stratton's Independence, Colo., g.	788	240	375	4,130,860
Strong, Colo., g.	300	375	200	2,475,000
St. Eugene Con., B. C., s.	210	....	....	210,000
St. John del Rey, Brazil, g	102	142	153	14,158,949
Sunday Lake, Mich., l.	40	....	....	40,000
Sunset, B. C., s. l.	....	6	....	6,000
Susquehanna Iron & Steel.	68	90	90	762,500
Swansea, Utah, s. l.	29	....	....	330,500
Syndicate, Cal., g.	....	2	....	82,000
Tamarack, Mich., c.	1,200	....	....	8,490,000
Temple Iron, Pa.	....	7	14	21,500
Tennessee Coal & Iron, pf.	20	20	20	307,104
Tennessee, Tenn., c.	....	....	219	218,750
Texas & Pacific Coal, Tex.	120	120	120	2,160,000
Thirty-three, Cal., oil.	....	120	120	240,000
Thomas Iron, Pa.	....	200	....	200,000
Tidewater Steel, Pa., pf.	....	....	30	30,000
Tomboy, Colo., g.	216	72	....	1,244,000
Tonopah-Alpine, Nev., g. s	....	....	70	70,000
Touraine, Colo., g.	9	....	....	96,119
Town Topics, Colo., g. s.	15	20	15	50,000
Tri-mountain, Mich., c.	....	....	300	300,000
Trinity County, Cal., g.	....	....	35	34,561
Uncle Sam Con., Utah, g.s.	45	....	....	45,000
Union, Cal., oil.	118	179	74	370,870
Union, Colo., g.	25	25	....	445,244
Union Mill, Mex.	31	26	30	408,263
Union, Kan., z. l.	7	....	....	16,000
United (Cripple Creek), Colo., g.	....	280	40	319,933
United (Creede) Colo., g. s.	....	....	10	45,000
United, Mo., com., z.	....	15	16	30,725
United, Mo., pf., z.	30	32	34	125,356
United, Mont., pf., c.	....	150	300	450,000
United Petroleum, Cal.	....	34	17	50,638
United Verde, Ariz., c.	....	....	2,025	15,060,322
U. S. Crude Oil, Cal.	24	....	....	27,220
U. S. Marble, Wash.	39	15	....	53,750
U. S. Red. & Ref., Colo., common	....	177	237	414,078
U. S. Red. & Ref., Colo., pf	....	236	237	472,421
U. S. Steel Corp., com.	15,228	20,333	12,708	48,267,952
U. S. Steel Corp., pf.	26,733	35,720	30,404	92,876,993
Utah Con., Utah, c.	732	....	954	1,686,000
Utah, Utah, g.	14	12	14	221,000
Virginia-Carolina Chemical, common	480	1,320	700	3,678,820
Virginia-Carolina Chem., pf.	920	960	960	7,020,869
Ventura Con., Cal., oil.	....	5	....	5,000
Victoria Coal & Coke, W. Va., com.	15	....	....	15,000
Victoria Coal and Coke, W. Va., common.	15	....	....	15,000
Vindicator Con., Colo., g.	170	253	198	1,115,000
Waldorf, Colo., g.	....	24	23	47,000
Warner, Cal., oil.	10	....	....	10,000
Wasp No. 2, S. D., g.	3	2	....	5,700
West Mountain, Utah.	....	....	9	9,000
Westmoreland Coal, Pa.	750	750	750	8,250,000
White Rock, Nev., g. s.	....	2	....	2,000
Wolverine, Mich., c.	240	240	330	1,320,000
Yankee Con., Utah, g. s. l.	....	75	....	75,000
Yellow Aster, Cal., g.	....	30	70	543,789
Ymir, B. C.	192	48	....	288,000
Yreka, Cal., g.	8	....	....	58,000

c.—Copper. g.—Gold. l.—Iron. l.—Lead. q.—Quicksilver. s.—Silver. z.—Zinc.

ASSESSMENTS

Name of Company.	1901.	1902.	1903	Grand Total.
Addie, Utah, g. s. l.	....	$2.500	....	5.000
Admiral, Utah, g. s. l.	.....	2.500	....	2.500
Ajax, Utah, g. s. l.	15.000	30.000	$15.000	60.000
Alaska, Cal., g.	20.000	....	....	20.000
Alaska, Utah, g. s. l.	12.000	28.000	24.000	118.000
Albion, Utah, g. s. l.	20.000	24.000	8.000	52.500
Allah, Utah, g. s. l.	....	2.500	2.500	5.000
Allouez, Mich., c.	240.000	....	....	1.760.930
Alma, Cal., g.	....	10.000	15.000	25.000
Alpha, Nev., s.	3.150	6.300	5.250	337.050
Alta, Nev., s.	10.800	10.800	5.400	3.724.310
American, Cal., g.	....	....	50.000	50.000
American, Utah, g. s. l.	....	5.000	15.000	20.000
Andes, Nev., s.	10.000	15.000	20.000	1.270.000
Annandale, Utah, g. s. l.	....	5.000	6.333	11.333
Apex, Utah, c.	....	5.000	....	5.000
Apollo, Alaska, g.	10,000	....	....	10,000
Apo Con., Cal., g.	....	50,000	....	50,000
April Fool, Nev., g. s.	....	50,000	....	50,000
Argentum-Juniata, Colo., g.	....	104,000	....	104,000
Aurora, Utah, g. s. l.	....	500	....	500
Bachelor, Cal., oil.	6,000	....	....	6,000
Badger, Oregon, g.	10,000	10,000	10,000	40,000
Baker Divide, Cal., g.	....	12,000	....	12,000

ASSESSMENTS CONTINUED.

Name of company.	1901.	1902.	1903.	Grand Total.
Bald Eagle, Cal., oil	....	....	15,000	15,000
Bank of England, Utah	....	....	2,500	2,500
Belcher, Nev., s	52,000	26,000	10,400	3,691,600
Bear Flag, Cal., oil	6,761	....	....	6,761
Bellefontaine, Cal., g	10,000	....	....	40,000
Belle Josephine, Cal., g	....	....	6,000	6,000
Ben Butler, Utah, g. s. l.	2,500	10,000	1,250	31,250
Ben Butler, No. 3, Utah	....	....	1,000	1,000
Ben Franklin, Cal., g	....	15,000	....	15,000
Berkeley, Cal., oil	....	4,500	....	4,500
Best & Belcher, Nev., s	30,240	50,400	55,440	2,827,963
Bingham Placer, Utah	....	27,500	50,000	132,500
Black Bess, Utah, g. s. l.	....	....	15,000	15,000
Blue Eagle, Utah, g. s. l.	10,000	5,000	....	15,000
Blue Extension, Utah	5,000	2,500	....	7,500
Blue Goose, Cal., g	10,000	....	....	10,000
Bogan, Utah, s	12,500	....	....	39,375
Bonanza, Con., Utah, g. s.	....	....	2,000	2,000
Boss Tweed, Utah, g. s.	....	10,000	....	18,000
Bountiful, Utah, g. s. l.	....	15,000	....	20,000
Brown, Utah, g. s. l.	....	5,000	....	5,000
Brunswick Con., Cal., g.	40,000	45,000	60,000	370,000
Buckhorn, Utah, g.	1,000	....	....	1,000
Bullion, Nev., s	6,000	3,000	8,000	3,152,000
Burton, Utah, g. s. l.	....	....	1,000	1,000
Butte Basin, Cal., g	3,000	....	....	3,000
Butler, Utah, g. s. l.	2,500	....	....	2,500
Cactus, Cal., oil	....	....	2,000	2,000
Cadmus, Cal., g	....	8,000	4,000	12,000
Caledonia, Nev., s	15,000	30,000	60,000	3,375,000
California, Cal., oil	20,000	....	....	20,000
California Dredging, Cal., g.	30,000	....	....	30,000
California Mutual, Cal., oil	12,500	....	....	12,500
California, Utah, g. s. l.	....	30,000	45,000	75,000
Canton Placer, Cal., g	....	6,000	3,600	34,600
Carb. & Rattler, Utah	....	24,000	....	24,000
Caribou, Cal., oil	16,000	....	....	24,000
Carisa, Utah, g. s. l.	....	....	30,000	30,000
Carmelita, Cal., oil	10,000	10,000	....	50,000
Centennial, Mich., c	180,000	....	....	910,000
Century, Cal., oil	8,000	5,000	....	22,500
Century, Utah, g. s. l.	....	10,000	10,000	20,000
Cerulean, Cal., g	5,000	....	....	5,000
Challenge Con., Nev., s.	5,000	5,000	10,000	484,500
Champion, Cal., g	....	17,000	32,300	139,803
Chicago, Utah, g. s. l.	....	2,500	1,250	3,750
Chloride Queen, Idaho, s. l.	1,000	....	....	1,000
Chollar, Nev., s	22,400	22,400	39,200	2,198,800
Christmas, Utah, g. s. l.	1,500	1,500	1,500	9,000
Coe, Cal., g	....	25,000	8,000	33,000
Columbus Con., Cal., g	....	3,000	4,500	9,500
Commonwealth, Utah, g.s.l	....	2,500	....	2,500
Comstock, Utah, g. s. l.	20,000	30,000	....	50,000
Confidence, Nev., s	9,984	4,992	9,984	583,806
Con. Cal. & Va., Nev., g.s.	....	54,000	162,000	1,099,200
Con. Golden Gate & Sulph.	....	45,000	....	45,000
Con. Imperial, Nev., s.	10,000	10,000	....	2,250,000
Con. New York, Nev., s.	....	....	25,000	188,500
Con. St. Gothard, Cal., g.	10,000	10,000	5,000	75,000
Constellation, Utah, g. s. l.	....	2,250	....	63,000
Contra Costa, Cal., con.	30,000	....	....	30,000
Copper Queen, Utah, c.	....	4,000	....	4,000
Copper Range, Utah, c.	....	....	2,500	2,500
Crown Point, Nev., s.	15,000	20,000	20,000	3,060,000
Crusader Con., Utah, g.s.l.	....	2,500	....	7,500
Dalton, Utah, g. s. l.	5,000	7,500	....	71,250
Daylight, Utah, g. s. l.	10,000	8,000	10,000	28,000
Del Monte, Cal., oil	20,000	....	....	20,000
Dexter-Tuscarora, Nev., g.s.	....	....	8,000	46,000
Diamond Con., Utah	....	8,000	4,000	20,000
Diamond Creek, Cal., g.	....	20,000	....	20,000
Dublin, Cal., g	....	5,000	....	15,000
East Honorine, Utah	....	5,000	....	5,000
East Sierra Nevada, Nev., s.	....	....	5,000	25,000
East Valeo, Utah, g. s. l.	5,000	....	800	5,800
Eclipse, Cal., g	....	....	5,000	5,000
Eldorado, Cal., oil	....	10,000	....	10,000
Elise, Utah, g. s. l.	....	10,000	10,000	20,000
Ella Eldon, S. D., g	500	500	500	1,500
Elephant, Utah, g. s. l.	....	....	5,000	5,000
Emerald, Utah, g. s. l.	1,500	10,750	6,000	21,250
Equality, Cal., oil	....	10,000	....	10,000
Esperanza, Cal., g	....	....	5,000	5,000
Eureka Con. Drift, Cal., g	10,000	5,000	7,500	235,500
Eutonia, Utah, g. s. l.	2,000	6,000	2,000	19,000
Exchange, Utah, g. s. l.	1,500	....	....	2,500
Exchequer, Nev., s	....	....	8,000	1,031,000
Fall Creek, Cal., g	10,000	....	....	10,000
Fauna, Cal., oil	....	....	1,500	1,500
Four Aces, Utah, g. s. l.	5,000	....	....	27,500
Free Coinage, Utah, g. s.	5,000	....	....	5,000
Free Silver, Utah, g. s.	....	....	500	500
Fremont Con., Cal., g	....	10,000	15,000	25,000
Fifteen-Three, Cal., oil	....	10,000	....	10,000
Galena, Utah, g. s. l.	5,000	6,000	5,000	26,000
Gambetta, Cal., g	....	....	9,000	9,000
Garibaldi, Cal., g	....	3,000	....	11,000
Gerrymander, Cal., g	....	5,000	....	20,000
Giant, Cal., oil	24,107	....	....	24,107
Gibraltar Con., Cal., g	....	5,000	....	5,000
Gold Hill, Cal., g	25,000	25,000	12,000	27,000
Gold Hill, Cal., g	25,000	25,000	12,000	87,000
Gold Run Dev., Cal., g.	....	....	10,000	10,000
Golden Channel, Cal., g.	....	....	1,500	7,000
Golden Eagle, Nev., s.	....	13,200	13,200	26,400
Golden Fleece, Cal., g	....	....	25,000	25,000
Golden Gate Ext., Utah	....	....	2,000	2,000
Golden Jubilee, Cal., g.	....	....	5,000	5,000
Golden Star, Cal., g.	2,500	4,000	....	10,000
Golden West, Cal., g.	....	....	5,000	5,000
Golconda, Nev., g. s.	750	750	750	2,250
Goleta Con., Cal., g.	30,000	....	....	93,000
Gonyon, Utah, g. s. l.	3,750	....	....	6,250
Good Hope, Utah, g. s. l.	2,000	....	....	2,000
Gould, Cal., oil	25,000	....	....	25,000
Gould & Curry, Nev., s.	43,000	32,400	37,800	4,856,650
Grand Prize, Cal., oil	20,000	....	....	20,000
Grape Vine Cañon, Cal., g.	10,000	....	5,000	39,000
Grizzly, Cal., g	....	10,000	30,000	46,500
Gypsy Blair, Utah, g. s. l.	....	....	10,000	10,000
Hale & Norcross, Nev., s.	11,200	44,800	44,800	5,840,680
Hanford-Fresno, Cal., oil	24,140	....	....	24,140
Hawk-McHenry, Utah, g.	....	15,000	....	15,000
Homestake, Utah, g. s. l.	....	10,000	....	60,000
Horsefly, Cal., g	10,000	....	....	18,000
Humboldt, Utah, g. s. l.	....	600	....	1,200
Imperial, Cal., g	2,000	3,000	....	5,000
Independent, Cal., g	10,000	....	15,000	25,000
Indian Pete, Utah, g. s. l.	....	....	5,000	5,000
Ingot, Utah, g. s. l.	10,000	....	....	10,000
International, Utah, c.	....	5,000	....	5,000
Inyo Marble, Cal.	5,000	5,000	6,000	181,000
Iron Prince, Utah, g. s. l.	....	....	625	625
Jefferson, Utah, g. c.	1,750	1,200	....	4,450
Jenny Lind, Cal., g	8,000	9,000	6,000	23,000
Joe Bowers, Utah, g. s. l.	21,000	10,500	10,500	56,000
Jubilee, Cal., g	....	10,000	25,000	35,000
Julia Con., Nev., s.	....	6,600	3,300	1,511,700
Jumbo, Utah, g. s. l.	....	1,200	800	2,000
Junction, Cal., oil	25,000	....	....	25,000
Justice, Nev., s	21,000	17,750	31,500	3,753,750
Karl Brown, Cal., oil	15,000	....	....	15,000
Kentuck Con., Nev., s.	....	....	8,400	136,850
Kern River, Cal., oil	40,000	20,000	20,000	80,000
Karma, Cal., g	....	....	5,000	5,000
Kennedy, Cal., g	....	....	100,000	100,000
Kern Cañon, Cal., oil	....	....	6,000	6,000
Keystone, Cal., g	....	3,000	....	3,000
Kings County, Cal., oil	6,000	....	....	6,000
Lady Washington, Nev., s.	....	8,640	5,400	180,480
Larkin, Cal., g	10,000	12,000	5,000	45,000
La Palma, Mex., s. l.	....	....	30,000	30,000
La Reine, Utah, g. s. l.	....	5,000	3,000	3,000
La Suerte, Cal., g	5,000	4,750	7,500	59,750
Laurel, Cal., g	....	2,500	....	2,500
Lead King, Utah, s. l.	....	....	2,500	2,500
Leo, Mont., g. s. c.	2,500	....	....	2,500
Linda, Vista, Cal., oil	11,460	3,000	....	14,460
Little Chief, Utah, g. s. l.	16,000	16,000	12,000	64,000
Little Pell Con., Utah	....	....	10,000	10,000
Little Jimmie, Utah, g. s. l.	....	1,875	....	1,875
Little Standard, Cal., oil.	....	10,000	....	30,000
Live Oak Con., Cal., g.	....	8,000	....	48,000
Lombard, Utah, g. s. l.	1,250	....	....	1,250
Los Angeles, Cal., oil	....	5,000	....	5,000
Lucky Bill, Utah, g. s. l.	12,000	....	18,000	91,300
Madeline, Utah, g. s. l.	....	10,000	....	10,000
Madsen, Utah, g. s. l.	1,250	2,500	2,500	6,250
Mammoth, Nev., g. s.	....	2,000	....	2,000
Manhattan, Utah, g. s. l.	2,500	7,500	5,000	15,000
Maple Creek, Cal., g.	10,000	....	20,000	30,000
Maple Grove, Cal., g.	....	....	500	500
Maple, Utah, g. s. l.	3,000	6,000	4,000	13,000
Marina Marsicano, Cal., g.	1,000	24,000	18,000	104,360
Mariposa Com'l, Cal., g.	50,000	....	....	210,000
Martha Washington, Utah.	9,000	15,000	15,500	54,500
May Day, Cal., g.	2,500	1,500	1,500	25,500
May Day, Utah, g. s. l.	....	....	22,000	22,000
Mayflower Gravel, Cal., g.	6,000	....	....	19,500
Mayflower, Utah, g. s. l.	5,000	5,000	2,500	14,500
Mazeppa, Cal., g.	....	2,000	2,000	9,000
McKinley, Utah, g. s. l.	1,250	....	....	1,250
McKittrick, Cal., oil	15,000	6,000	....	21,000
McKittrick Con., Cal., oil.	18,000	....	....	30,500
Melcher, Utah, g. s. l.	625	1,375	1,500	4,500
Menlo, Cal., g.	....	6,000	....	6,000
Mercantile, Cal., oil	....	5,000	....	5,000
Metallic Hill, Utah, g.s.l.	....	....	5,000	5,000
Meteor, Utah, g. s. l.	1,980	....	....	13,690
Mexican, Nev., s.	50,400	30,240	40,320	2,480,480
Middle Yuba, Cal., g.	....	....	25,000	25,000
Mineral Hill, Cal., g.	....	....	2,000	6,000
Minnie, Utah, g. s. l.	....	1,000	....	4,000
Mistletoe, Cal., g.	....	10,000	....	10,000
Mohave, Utah, g. s. l.	....	....	5,000	5,000
Mohican, Cal., g.	10,000	5,000	....	15,000
Monte Cristo, Utah, g. s. l.	....	2,500	....	2,500
Morgan, Cal., g.	....	....	10,000	10,000
Morning Glory, Wash., g.	....	3,000	....	3,000
Morning Star, Nev., g. s.	....	....	500	500
Mountain Lake, Utah	....	5,000	2,500	7,500
Mountain View, Cal., g.	15,000	....	....	15,000
Mt. Blanc Con., Cal., g.	1,200	....	....	1,250
Mt. Diablo, Cal., oil	10,000	5,000	....	65,000
Mt. Pleasant Con., Cal., g.	....	....	15,000	15,000
Murray Hill, Utah, g. s. l.	....	....	15,000	15,000
Naildriver, Utah, g. s. l.	....	....	2,500	2,500
Napa County, Cal., c.	....	....	5,000	5,000
National Con., Cal., g.	10,000	5,000	5,000	88,685
Navajo, Utah, g. s. l.	2,500	....	....	2,500
Nevada County, Cal., oil	....	....	3,000	3,000
Nevada, Utah, c.	....	5,000	....	5,000
New Almaden, Mex., q.	....	....	5,000	5,000
New Boston, Utah, g. s. l.	....	....	500	500
New Century, Cal., oil	15,000	....	....	15,000
New Erie, Utah, g. s. l.	7,500	500	....	10,500
New Independence, Cal., g.	....	....	20,000	20,000
New Mercur, Utah, g. s. l.	....	4,200	2,100	6,300
New Montezuma, Cal., g.	....	10,492	10,531	26,206
New Pass, Nev., g. s.	....	....	20,000	20,000
New Red Wing, Utah	....	15,000	22,500	37,500
New York Bonanza, Utah.	....	....	18,000	18,000
Niagara, Utah, g. s. l.	....	97,500	....	97,500
Nineteen, Cal., oil	6,000	....	....	6,000
Nixon Placer, Cal., g.	....	....	5,000	5,000
Northern Light, Cal., g.	....	....	5,000	5,000
Northern Light, Utah	18,000	16,000	....	50,000
Nugget Placer, Cal., g.	10,000	....	....	10,000
Occidental Con., Nev., s.	10,000	15,000	20,000	569,179
O. K. Extension, Utah	....	....	5,000	5,000
Old Bullion, Utah, g. s. l.	....	4,000	....	4,000
Old Colony & Eureka, Utah.	....	7,500	8,750	18,750
Old Evergreen, Utah, g. s. l.	....	6,000	6,000	12,000
Old Home Con., Cal., g.	1,000	2,000	....	15,000
Old Indian, Utah, g. s. l.	....	2,000	....	4,000
Old Susan, Utah, g. s. l.	500	....	....	8,000
Olinda, Cal., oil	....	10,000	....	10,000
Omaha Con., Cal., g.	....	50,000	66,500	251,500
Onbir, Nev., s.	45,360	45,360	45,360	4,839,528
Onbir (Cent. Dist.) Nev., g.	....	50,000	66,500	251,500
Orient, Cal., g. s.	35,000	....	35,000	195,000
Orient, Utah, g. s. l.	2,500	2,000	....	4,500
Orleans, Cal., g.	5,000	....	....	22,000
Osceola Con., Cal., g.	2,000	....	....	15,810
Overman, Nev., s.	23,040	23,040	34,560	4,239,030
Pacific Utah, g. s. l.	....	600	....	1,830
Paris, Utah, c.	....	2,500	....	7,500
Park City, Utah, g. s. l.	....	....	625	625
Patterson Creek, Cal., g.	....	10,000	....	10,000
Pawning, Cal., g.	....	2,500	....	5,000
Peruvian Con., Utah, g. s. l	....	....	7,500	75,000
Petroleum Center, Cal., oil	61,500	20,500	....	102,500
Petrolia, Cal., oil	10,000	....	....	10,000
Pilot, Cal., g.	....	10,000	....	10,000
Pioneer, Utah, g. s. l.	....	1,000	....	1,000
Planet, Cal., g.	....	10,000	20,000	30,000
Posey Con., Cal., g.	....	....	25,000	25,000
Potosi, Nev., s.	28,000	22,400	39,200	2,325,200
Princess Maud, Wash., g.	....	3,000	....	3,000
Prospect Mt. Tunnel, Nev.	....	10,000	....	10,000
Prosperity, Cal., oil	25,000	....	....	25,000
Providence, Cal., g.	20,000	....	....	20,000
Provident, Cal., oil	7,500	....	7,500	15,000
Purjue Surprise, Utah	....	1,000	....	2,000
Queen Esther, Cal., oil	5,000	....	....	5,000
Raven, Cal., oil	10,500	....	....	10,500
Raymond, Utah, g. s. l.	12,500	....	....	12,500
Reamer Con., Cal., g.	....	10,000	20,000	30,000
Red Bank, Cal., oil	6,000	....	....	6,000
Red Slide, Cal., g.	....	....	20,000	20,000
Red Wing, Utah, g. s. l.	....	1,000	....	1,000
Red Wing Ext., Utah, g.s.l.	....	500	....	1,000
Reddick, Cal., g.	....	3,000	....	13,000
Reward, Cal., g.	14,500	6,000	....	97,500
R. G. W., Utah, g. s. l.	2,500	1,500	....	7,000
Ridge & Valley, Utah, g.s.l.	10,000	....	12,500	27,500
Roberts, Cal., oil	3,000	....	....	3,000
Romeo Con., Utah, g. s. l.	....	....	5,000	5,000
Ruby Hill, Nev., g. s. l.	1,000	1,000	....	2,600
Rusby, Cal., g. s.	....	14,000	7,000	21,000
Sailor Con., Cal., g.	3,000	1,000	....	21,000
Salt Lake, Utah, g. s. l.	2,500	....	....	2,500
Sam Houston, Cal., g. s.	....	10,000	5,000	15,000
Sampson, Utah, g. s. l.	....	10,000	5,000	15,000
San Pablo, Cal., oil	....	5,000	....	5,000
Savage, Nev., s.	22,400	33,600	33,600	7,433,200
Scorpion, Nev., s.	....	....	5,000	453,000
Sea Breeze, Cal., oil	20,000	....	....	20,000
Sea Swan, Utah, g. s. l.	2,500	....	....	2,500
Seg. Belcher & Mides, Nev., s.	6,000	3,000	20,000	413,000
Sharp, Utah, g. s. l.	5,000	....	....	5,000
Shasta, Cal., oil	20,000	....	....	20,000
Shasta Co. Sm. & Ref., Cal.	....	....	25,000	25,000
Sheep Ranch, Cal., g.	....	....	115,000	115,000
Shenandoah Con., Cal., g.	4,000	....	8,000	12,000
Shoebridge-Bonanza, Utah.	4,000	....	....	13,600
Showers Con., Utah, g. s. l.	24,000	12,000	....	46,000
Sierra, Cal., g.	....	....	10,000	10,000
Sierra Nevada, Nev., s.	50,000	30,000	40,000	6,921,910
Sierra Union, Cal., g.	....	75,000	....	75,000
Silver Bell, Utah, g. s. l.	2,500	....	5,000	20,000
Silver Bow, Utah, g. s. l.	7,500	5,000	....	17,500
Silver Cloud, Utah, g. s. l.	2,500	....	....	7,500
Silver Coin, Utah, g. s. l.	....	....	5,000	5,000
Silver King, Ariz.	25,000	15,000	....	530,000
Silver Queen, Utah, s.	....	....	2,500	2,500
Silver Shield, Utah, g. s. l.	3,000	6,000	33,000	42,000
Silver State, Utah, g. s. l.	....	2,500	....	4,000
Skagit Cumb. Coal, Wash.	22,500	....	....	29,500
Skylark, Utah, c.	5,000	7,500	5,000	27,500
Snow Flake, Utah, g. s. l.	7,000	10,000	15,000	54,500
Snake Creek Con., Utah	....	....	2,500	2,500
Sonora, Cal., g.	4,000	8,000	2,500	19,500
Southern Queen, Utah	....	1,250	....	1,250
South Lily, Utah, g. s. l.	....	500	....	2,000
South Eureka, Cal., g.	....	3,000	8,000	17,000
South Sliger, Cal., g.	10,000	....	3,000	13,000
South Swansea, Utah	....	....	24,000	24,000
Spanish Bar, Cal., g.	5,000	....	....	23,000
Spider, Utah, g. s. l.	....	....	2,000	2,000
Springfield, Utah, g. s. l.	....	5,000	....	5,000
Stansburg, Utah, g. s. l.	....	....	2,500	2,500
Star, Utah, g. s. l.	....	7,500	5,000	72,500
Steamboat, Utah, g. s. l.	....	....	750	750
Stockton, Utah, g. s. l.	....	5,000	1,000	6,000
St. Louis-Vassar, Utah.	....	....	10,000	10,000
Sumdum, Alaska, g.	....	25,000	25,000	50,000
Sumdum Chief, Alaska, g.	....	25,000	....	25,000
Sunrise, Utah, g. s. l.	....	750	1,000	1,750
Sunset Center, Cal., oil	....	....	15,000	15,000
Sunset District, Cal., oil	7,500	....	....	7,500
Superior, Cal., oil	4,600	....	....	4,600
Swansea, Utah, g. s. l.	....	....	15,000	18,500
Tanama, Cal., g.	30,000	10,000	10,000	60,000
Tesora, Utah, g. s. l.	80,000	....	....	102,000
Tetro, Utah, g. s. l.	27,500	12,000	12,000	102,500
Texas, Cal., g.	10,000	....	....	55,000
Tintic Copper King, Utah, c.	....	2,500	....	2,500
Tintic, Utah, g. s. l.	....	3,500	....	7,875
Tomboy, Utah, g. s. l.	....	2,500	....	7,500
Tonopah & Salt Lake, Nev., g.	....	....	20,000	20,000
Trent, S. Dak., g.	1,500	....	....	7,500
Tule Belle, Cal., g.	10,000	....	10,000	20,000
Twentieth Century, Utah	....	1,250	....	2,500
Ukiah, Cal., oil	10,000	....	....	10,000
Ultimo, Cal., g.	....	30,000	21,000	51,000
Uncle Sam, Utah, g. s. l.	....	6,000	....	6,000
Union Con., Nev., s.	25,000	30,000	30,000	2,775,000
United Sunbeam, Utah	30,000	20,000	....	50,000
Usona, Cal., oil	....	1,000	....	1,000
Utah Con., Nev., s.	20,000	20,000	10,000	550,000
Utah-Wyoming, Utah, oil.	....	2,500	2,500	5,000
Uyak Bay, Alaska, g.	....	3,000	....	3,000
Valley View, Cal., oil	17,500	....	....	17,500
Vernon, Cal., oil	25,000	....	....	25,000
Victor, Utah, g. s. l.	5,000	15,000	....	35,000
Virginia Con., Cal., g.	....	10,000	....	120,000
Vulcan Sm. & Ref., Cal.	....	5,000	10,000	15,000
Wabash, Utah, g. s. l.	....	....	75,000	75,000
Wandering Jew, Utah	....	500	....	3,500
Wasatch, Utah, g. s. l.	6,000	....	....	6,000
Washington, Cal., oil	7,000	....	....	7,000
Wedge Exten., Utah, g. s. l.	....	500	....	500
Wellington, Cal., oil	7,000	7,500	5,000	19,500
West Argent, Utah, g. s. l	10,000	....	....	10,000
West Century, Utah, g. s. l.	....	5,000	5,000	10,000
West Lake, Cal., oil	10,000	....	....	10,000
West Morning Glory, Utah.	1,250	13,750	....	21,000
West Mt. Placer, Utah, g.	3,750	....	....	11,750
Western Union, Cal., oil	....	1,000	....	3,000
White Pine, Nev., g. s.	....	....	5,000	5,000
William Tell, Cal., g.	....	....	1,500	1,500
Willietta, Cal., g.	10,000	20,000	30,000	60,000
Wilson & Barrett, Utah	....	30,000	....	30,000
Wisconsin, Cal., oil	25,000	....	....	25,000
Yankee Con., Utah, g. s. l.	10,000	....	....	17,500
Ybarra, Cal., g.	....	10,000	20,000	30,000
Yellow Jacket, Nev., s.	36,000	36,000	30,000	5,970,000
Yuba Con., Cal., g.	45,000	6,000	....	53,500
Zecca Lake, Cal., oil	1.875	....	....	1,875

c.—Copper. g.—Gold. l.—Lead. q.—Quicksilver. s.—Silver.

TO ENGINEERS VISITING NEW YORK.

A room for the exclusive use of visiting mining engineers is maintained at the New York office of the ENGINEERING AND MINING JOURNAL. Visitors to the metropolis are cordially invited to take advantage of the facilities it offers, by having their mail addressed in care of the JOURNAL and making this office their headquarters. The managers of the branch offices will also be glad to welcome visiting engineers and to be of any service to them that they can.

TO ENGINEERS VISITING LONDON.

We are informed that the Institution of Mining and Metallurgy offers to all members of the American Institute of Mining Engineers non-resident in Great Britain, the privilege of free use of the Institution offices and library in Salisbury House, London Wall, E. C. Visiting engineers may have their letters addressed to the offices of the Institution, and thus enjoy the advantages of temporary office accommodation in the city of London.

NOTE.—The ENGINEERING AND MINING JOURNAL is desirous of obtaining certain back numbers and volumes, and would be willing to pay a liberal price for them. Those wanted are volumes 53 and 54 (1892), complete; No. 19 of volume 51 (May 9, 1891); Nos. 3 and 24 of volume 60 (July 20 and December 14, 1895); the index to volume 63 (1897) of the ENGINEERING AND MINING JOURNAL. Anyone having any of these numbers to dispose of will oblige by informing us as soon as possible.

METAL MARKET.

New York, Jan. 6.

Gold and Silver Exports and Imports,

At all United States Ports in November and Year.

Metal	November.		Year.	
	1902.	1903.	1902.	1903
Gold:				
Exports	$720,331	$993,159	$33,177,479	$42,882,178
Imports	5,981,743	11,360,343	42,006,681	48,027,051
Excess	I. $5,261,412	I. $10,367,193	I. $8,829,202	I. $5,144,873
Silver:				
Exports	3,762,974	6,077,762	43,726,079	34,119,089
Imports	2,199,069	2,566,426	23,701,649	21,895,853
Excess	E. $1,563,905	E. $3,511,336	E.$26,024,430	E.$12,223,836

These exports and imports cover the totals from all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

The new year opens with business rather quiet, but with fair prospects for the future in most lines. The speculative markets are showing some improvement. In general, trade and manufacturing are on a sound basis.

The United States Steel Corporation, at the meeting of the directors, held on January 5, declared the regular dividend of 1.75% on the preferred stock for the quarter ending with December, but decided to pass the dividend on the common stock for that quarter. The net result of 1903, is, therefore, that the preferred stock has received 7% and the common stock 2.5%. The preliminary statement of earnings submitted at this meeting shows that net earnings, after deducting working expenses, and the various charges, were as given in the following table:

Net earnings for the year	$108,979,012
Depreciation fund, regular	$4,485,120
Depreciation in inventories and accounts	10,000,000
Extraordinary replacement funds	9,194,715
Sinking funds	5,387,852
Intercst	19,086,945
Depreciation in inventions and accounts	5,750,000
Total charges	$53,904,632
Net balance	$55,074,380

The dividends declared amounted to 7% on the preferred stock, or $30,404,173; and 2.5%, or $12,707,562, on the common stock. This is a total of $43,111,735, leaving an undivided balance of $11,962,645; which compares with $34,253,657 for 1902.

The net earnings by months for two years past have been as follows:

	1902.	1903.
January	$8,901,016	$7,425,775
February	7,678,583	7,730,361
March	10,135,858	9,912,571
April	12,320,766	10,905,204
May	13,120,930	12,744,324
June	12,220,361	12,992,780
July	12,041,914	12,384,647
August	12,972,729	10,918,174
September	11,930,846	9,120,134
October	12,652,707	7,675,141
November	10,686,906	4,069,901
December	8,646,147	3,100,000
Total	$133,708,763	$108,979,012

The net earnings for 1903 show a decrease from 1902 amounting to $24,729,751. The surplus, after deducting charges, shows a decrease of $22,291,012. The net earnings reached a maximum of $12,992,780 in June; from that point they fell off rapidly until the estimated amount in December was only $3,100,000. The charges do not show any great difference from 1902, with the exception of the item of $5,750,000 for depreciation and adjustment of accounts, which is doubtless intended to cover the falling off in values of material on hand.

The unfilled orders on hand on December 31, 1902, amounted to 5,247,253 tons of material; on December 31, 1903, they were estimated at 3,215,123 tons.

Prices of Foreign Coins.

	Bid.	Asked
Mexican dollars	$0.43¾	$0.46¾
Peruvian soles and Chinese pesos	.41	.44
Victoria sovereigns	4.85½	4.87
Twenty francs	3.85	3.87
Spanish 25 pesetas	4.78	4.82

OTHER METALS.

Daily Prices of Metals in New York.

Dec.-Jan.	Sterling Exchange.	Silver—N. Y. Cts.	Silver—London, Pence.	Copper—Lake, Cts. per lb.	Copper—Electrolytic, Cts. per lb.	Copper—London, £ per ton.	Tin, Cts. per lb.	Lead, Cts. per lb.	Spelter—N. Y., Cts. per lb.	Spelter—St. Louis, Cts. per lb.
—										
31	4.85	56¼	26⅛	12 @12⅛	12¼ @12¾	56⅞	28¾	4 20 @4 25	4.87½	4.70
1	.....	....	26	.....	.....	....	....	.....	.....	.....
2	4.84	56	26	12 @12⅛	12¼ @12¼	....	29¼	4.20 @4.25	4.87½	4.70
4	4.84	56⅞	26⅜	12⅛ @12⅜	12 ¼ @12½	58	29¼	4.20 @4.25	4.87½	4.70
5	4.84¼	57¼	26⅞	12¼ @12⅜	12⅜ @12⅝	58⅜	29¼	4.20 @4.25	4.87½	4.70
6	4.84⅛	57¾	26⅞	12¼ @12⅜	12⅜ @12⅝	57¾	29	4.20 @4 25	4.87½	4.70

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wire-bars: the price of electrolytic cathodes is usually 0.25c. lower than these figures

Silver has been strong and market a rising one, owing to purchases by the Indian Government chiefly, and to some extent by the bazaars.

The United States Assay Office in New York reports receipts of 48,000 oz. silver for the week.

Copper.—During the week under review the market has developed considerable strength, consumers both here and abroad buying freely. Prices have advanced steadily, and the closing quotations are given at 12⅝ @12⅝c. for Lake; 12¼@12½c. for electrolytic in ingots, cakes and wirebars; 12@12¼c. in cathodes; 12@12⅛c. for casting copper.

The market for standard copper in London, which closed last week at £56 17s. 6d., opened on Monday at £58, advanced on Tuesday to £58 7s. 6d., but declined again on Wednesday, and the closing quotations are cabled as £57 15s.@£57 17s. 6d for spot, £57 5s.@£57 7s. 6d. for three months.

Statistics for the second half of December show an increase in the visible supplies of 1,400 tons.

Refined and manufactured sorts we quote: English tough, £60@£60 10s.; best selected, £61@£61 10s.; strong sheets, £68@£68 10s.; India sheets, £65@£65 10s.; yellow metal, 6⅜@6½d.

Tin has ruled very firm throughout the week, up to 29½c. being paid. At the close the market has eased off somewhat, spot and futures being obtainable at 29c.

The foreign market, which closed last week at £132 17s. 6d., opened on Monday at £134 5s., remained steady on Tuesday, but the closing quotations on Wednesday are cabled at £131 5s.@£131 7s. 6d. for spot, £131 10s.@£131 12s. 6d. for three months.

Statistics for the month of December show a decrease in the visible supplies of 1,700 tons.

Lead has been in fair demand and nothing of special interest has transpired. The closing quotations are given as 4.15@4.17½c. St. Louis, 4.20@4.25c. New York.

The foreign market is very firm, Spanish lead being quoted at £11 7s. 6d.@£11 8s. 9d., English lead £11 10s.@£11 11s. 3d.

Spelter remains quiet but firm, without any special feature. The ruling quotations are given as 4.70c. St. Louis, 4.87½c. New York.

The foreign market is strong, good ordinaries being quoted at £21 15s., specials, £22.

Antimony is dull. We quote: Cookson, 6¾@7c.; Hallett's, 6@6¼c.; United States, Japanese, Italian, French, Hungarian and Chinese, 5½@5⅝c. per pound.

Nickel.—The price is quoted by leading producers at 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots, according to quantity, runs as high as 60c. per lb.

Platinum.—Demand continues steady, and the price remains at $19 per oz.

Messrs. Eimer & Amend, of New York, quote prices for platinum in manufactured forms, as follows: Heavy sheet and rod 72c. per gram; foil and wire, 75c. per gram; platinum crucibles and dishes, 77c. per gram; perforated wire, like cones, Gooch crucibles, etc., 82 per gram.

Quicksilver.—The New York price is $46.50 per flask for large lots, while a slightly higher figure is quoted for smaller orders. The San Francisco quotations continue at $44@$45 per flask for domestic orders and about $41.50 for export. The London price is £8 5s. per flask, with the same quotation asked by second hands.

Cadmium.—Herr Paul Speier, writing from Breslau, Germany, reports that the quotation is very firm. The price for metallic cadmium, 99.5%, is 675 marks per 100 kg. delivered in Breslau.

Minor Metals and Alloys.—Wholesale prices, f. o. b. works, are as follows:

	Per lb.
Aluminum	
No. 1, 99% ingots	33@37c.
No. 2, 90% ingots	31@34c.
Rolled Sheets	4c. up
Alum-bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2.10
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybde'm (50%)	$1.25
Ferro-Titanium (10%)	90c.
Ferro-Titanium (20@25.) N. Y.	55c.
Ferro-Tungsten (37%)	38c.
Magnesium, pure (N. Y.)	60c.
Manganese	$2.75
Mangan'e Cop. (20% Mn)	32c.
Mangan'e Cop. (30% Mn)	38c.
Molybdenum (Best)	$1.85
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Sodium metal	50c.
Tungsten (Best)	62c.

Variations in price depend chiefly on size of order.

Average Prices of Metals per lb., New York.

Month.	Tin. 1903	Tin. 1902.	Lead. 1903.	Lead. 1902.	Spelter. 1903.	Spelter. 1902.
January	28.33	23.54	4.075	4.000	4.865	4.27
February	29.43	24.07	4.075	4.075	5.043	4.15
March	30.15	26.32	4.442	4.075	5.349	4.29
April	29.81	27.77	4.567	4.075	5.530	4.37
May	29.51	27.85	4 325	4.075	5.639	4.47
June	28.34	29.36	4.210	4.075	5.697	4.96
July	27.68	28.38	4.075	4.075	5.662	5.27
August	28.29	28.23	4.075	4.075	5.725	5.44
September	26.77	26.60	4.243	4.075	5.686	5.49
October	25.92	28.07	4.375	4.075	5.510	5.38
November	25.42	25.68	4.218	4.075	5.238	5.18
December	27.41	25.68	4.162	4.075	4.731	4.78
Year	28.09	26.79	4.237	4.069	5.400	4.84

NOTE.—The average price of spelter in St. Louis for the month of January, 1903, was 4.689c. per lb.; for February, 4.681c.; for March, 5.174c.; for April, 5.375c.; for May, 5.469c.; for June, 5.537c.; for July, 5.506c; August, 5.55c. September 5.514c.; for October, 5.35c; for November, 4.86c; for December, 4.556c; for the year, 5.191 cents.

Average Prices of Copper.

Month.	New York. Electrolytic. 1903.	New York. Electrolytic. 1902.	New York. Lake. 1903.	New York. Lake. 1902.	London. Standard. 1903.	London. Standard. 1902.
January	12.159	11.053	12.361	11.322	53.52	48.43
February	12.778	12.173	12.901	12.378	57.34	55.16
March	14.416	11.882	14.572	12.088	63 95	53.39
April	14.454	11.618	14.642	11.986	61.12	52.79
May	14.435	11.856	14.618	12.234	61.73	54.08
June	13.842	12.110	14.212	12.440	57.30	53.98
July	13 094	11.771	13.341	11.923	58.64	52.89
August	12.962	11.404	13.159	11.049	58.44	51.96
September	13.205	11.480	13.315	11.760	56.82	52.68
October	12.801	11.449	12.954	11.722	55 60	52.18
November	12.617	11.288	12.813	11.553	56.30	51.08
December	11.952	11.430	12 084	11.599	56.36	50.56
Year	13.235	11.626	13.417	11.887	57.57	52.40

New York prices are in cents, per pound; London prices in pounds sterling, per long ton of 2,240 lbs., standard copper. The prices for electrolytic copper are for cakes, ingots or wire bars: prices of cathodes are usually 0.25 cent lower.

Average Prices of Silver, per ounce Troy.

Month.	1903. London, Pence.	1903. N. Y., Cents.	1902. London, Pence.	1902. N. Y., Cents.	1901. London, Pence.	1901. N. Y., Cents.
January	21.98	45.57	25.62	55.56	28.97	62.82
February	22.11	47.89	25.41	55.69	28.13	61.06
March	22.49	48.72	25.00	54.23	27.04	60.98
April	23.38	50.56	24.34	52 72	27.30	59.20
May	24.89	54.11	23.71	51.31	27.43	59.64
June	24.29	52.86	24.17	52.36	27.42	59.57
July	24.86	53.92	24.38	52.84	26.96	58.46
August	25.63	55.36	24.23	52.52	26.94	58.37
September	26.75	58.00	23.88	51.52	26.95	58.36
October	27.89	60.36	23.40	50.57	26.62	57.59
November	27.01	58.11	22.70	48.07	26.12	56.64
December	25.78	55.375	22.21	48.03	25.46	55.10
Year	24.75	53 45	24.09	52.16	27.11	58.95

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.